Insure VICTORY .... Buy Bonds for War .... Push Plans for Peace

Contractors and Engineers Monthly

Vol. 41, No. 4 APRIL, 1944 $2 a Year, 20 Cents a Copy

Highlights Of This Issue

Paving at Airfields
Both hot-mix and concrete paving at Army airfields are described in this issue. A 10,000 x 500-foot instrument-runway project at a southern airfield was served by a hot-mix plant producing 145 tons an hour, while subgrade stabilization and the paving of runways, taxiways and apron were included in the concrete job. See pages 1 and 47.

Planning Future Roads
Practical down-to-earth preparation of plans for its future highway work is being done by the Minnesota Highway Department, which already has considerable work ready for letting, with more soon to be at that stage. As part of the planning for post-war highways, consideration should be given to the proposed Interregional Highway System, more of the recommendations for which are discussed in this issue.
See pages 1 and 2.

Sewage Plant at Air Depot
Featured by the use of unit steel forms for the concrete structures and treated-timber trestles to carry the concrete influent and outfall lines, a new sewage works to serve both Army personnel and civilians at an Air Depot in the south was completed with dispatch.
See page 9.

Take Care of Equipment
Some hints on the proper care and use of off-the-road tires, a discussion of that all-important subject of proper lubrication of construction equipment, and a description of a state highway department's division shops are this month's contribution to the task of keeping present equipment at work for the duration.
See pages 18, 34, and 42.

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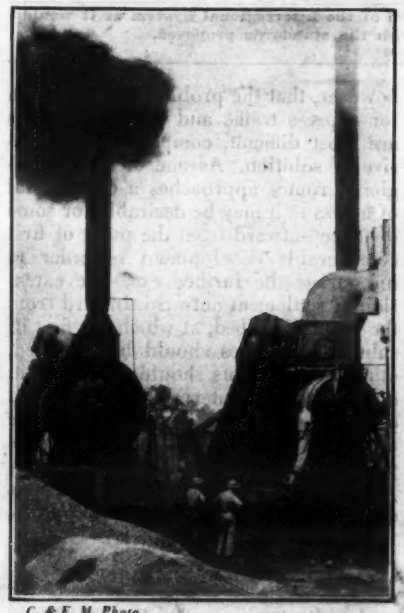


C. & E. M. Photo
A pair of driers serving the Simplicity System asphalt plant which furnished the hot-mix for runway paving at an Army airfield in Florida.

Post-War Planning Progress in Minn.

Pre-War Studies Aid Design; Competent Force Completes Plans and Specifications On Definite Quarterly Plan

✦ PAUL Bunyan doesn't work for the Minnesota Department of Highways, but people apparently having his fabulous abilities have produced surveys, plans, specifications, and contract documents, complete with definitely acquired right-of-way, for a program of highway work to meet an established schedule of completion dates, set in advance, by which progress is correlated and measured.

An ambitious program of planning for future construction has been set up which provides for $36,701,900 worth of construction divided as follows:

TYPE OF WORK	MILEAGE	ESTIMATED COST
Grading	867.3	$15,106,380
Bridges, 117		4,916,000
Stabilized Base and Bit. Surf. Treat.	473.5	3,292,500
Bit. Wear. Surf.	53.2	316.500
Paving	275.6	10.233,770
Stages 6-7-8	187.8	2,836,750

In order to assure orderly progress and complete control of the complex divisions of such a large program, the work was definitely outlined in a schedule of letting dates at which time certain portions were to be so complete that bids could be called for. Equitable distribution, both by districts and by classes of work, was made and the program divided into three parts to be ready

(*Concluded on page* 43)

Wide Hot-Mix Paving For a 2-Mile Runway At Southern Airfield

By THEODORE REED KENDALL, Editor

(*Photos on page* 84)

Cleared, Grubbed, Drained, Stabilized Rock-Base Laid, Primed, Paved with a Plant Mix at 145 Tons per Hour

✦ IN the creation of a 10,000 x 500-foot instrument runway at an airfield in the southeastern section of the country, a sandy area covered with scrub pine, palmetto and other small growth was converted into a smooth asphalt-paved area on a lime-rock base with a stabilized subgrade. The soil in this section is an extremely fine sand which is nearly impervious, holding water on the surface of the ground. Careful planning of the sequence of operations, each carried on in the area best suited to hasten completion of the job and not interfere with other work, made great speed possible in spite of bad weather conditions. The Area Engineer, U. S. Engineer Department, coordinated the operations of the several contractors, grading and drainage by one, stabilization and base by a second, and paving by a third, and each outfit cooperated to maintain the desired wartime pressure for early completion.

The 10,000-foot asphalt-paved runway has a 300 x 500-foot concrete turnaround at each end and a 1,000-foot stabilized end zone beyond each turnaround. The entire area was stabilized with Ocala lime rock to a depth of 6 inches, then an 8-inch lime-rock base was compacted, primed, and paved with a 3-inch asphaltic-concrete top in two 1½-inch courses.

The contract included widening existing taxiways and dispersal areas and the construction of new taxiways. For the widening, a 4-inch lime-rock base was laid, while the new taxiways were laid on a 6-inch base. The latter were stabilized for 12½ feet on either side and then 80 feet beyond this was sodded for shoulders. A warm-up apron 200 x 400 feet in area was built at each end of the new runway.

Clearing and Grubbing

The grading contractor went after the clearing and grubbing with bulldozers equipped with rake blades having teeth that ripped up the roots in the ground and quickly cleared the area. All large-sized roots had to be removed while the smaller ones succumbed to the action of a 30-inch gang disk harrow. All roots were hand-picked from the surface of the ground, stacked, and later burned.

Grading and Muck Removal

Over the entire field or runway area the fill averaged about 3 feet. Grading was carried on 24 hours a day, using eleven 13-yard Euclids, each hauling 15 yards, loaded by a 3-yard Koehring and a 2-yard Lorain dragline, both equipped with Hendrix buckets, and also two 26-yard, four 16-yard, and two 12-yard LeTourneau Carryall scrapers pulled by

(*Continued on page* 16)

PRECAST CONCRETE PILES FOR FLOODWALL

U. S. E. D. Photo
Truck-mixed concrete was used for foundation piles for the eight monoliths in the floodwall along the Arkansas River, near Tulsa, Okla., built by Ottinger Bros. of Oklahoma City for the U.S. Engineer Department. **See page 30.**

Interregional Highway System

Access, Right-of-Way, Design, Construction, and Costs

Committee Recommends Limited Access; Need for Enabling Legislation; Right-Of-Way Acquisition

✦ IN preparing its report on an Interregional Highway System (See C. & E. M., March, 1944, pg. 2), the National Interregional Highway Committee decided that the character of the interregional routes as main collectors of through traffic justifies granting preferential right-of-way to traffic moving on them over all crossing and entering traffic everywhere throughout the system. A proper facilitation of the express traffic, with due regard for safety and economy, requires, moreover, a reduction of the number of access and crossing points to a practicable minimum. This, in the opinion of the Committee, makes it desirable to provide, as promptly as possible, for the legal designation of all routes of the recommended system, in both their urban and rural sections, as limited-access highways.

This designation will empower administrative authorities, wherever and whenever necessary for the convenience of express traffic and the promotion of safety, to deny access to the interregional highways from abutting lands or to control or limit such access as may be found desirable, and similarly to deny or limit access, as desirable, from other public roads.

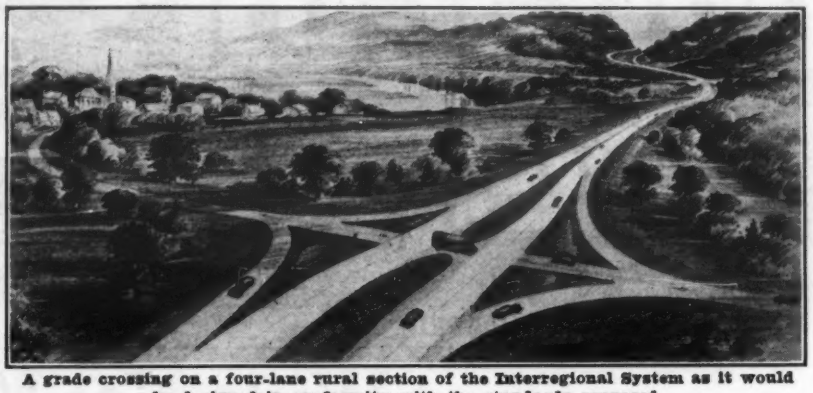
Rural Access

In many cases it will be found that unimportant rural cross roads can be closed and their slight traffic directed to other points of crossing. And where, in rural areas, the traffic on the interregional highway is light or only moderately heavy, it may not be necessary, immediately at least, to go to the length of grade separation at all retained intersections. But wherever a grade crossing is permitted on an interregional highway, the design of the intersection and the signs placed there should enable and require operators of crossing vehicles to make a positive determination of the safety of crossing, and should reveal to operators of vehicles on the main highway the presence of vehicles about to cross or enter. The design of the intersection should provide all physical safeguards, such as definite traffic channels and refuge islands, decelerating and accelerating space, etc., as may be necessary to afford a maximum of safety for both of the intersecting traffic streams and a maximum of facility for the traffic on the interregional highway.

Where traffic on the rural routes is heavy and, in the environs of cities, where it is desirable to discourage undue extension of road-bordering city growth, prohibition of access to the highway from abutting land, controlled access at specified points, and the closure or grade separation of all intersecting highways are essential.

If no prior right of access has existed, as will be the case where rural and suburban sections of the interregional routes are developed on new locations, it may not be considered essential to provide a local service road to abutting lands as an auxiliary of the interregional route. It probably will be necessary in such circumstances, however, to compensate the abutting owners for the denial of their right of access to the new facility.

Where a section of the interregional highway is developed on the location of an existing highway to which all abutting properties have previously had unlimited access, it may be necessary to provide properties denied access to the through highway with other means of ingress and egress. This may be accomplished by the construction of roads connecting the affected properties with other existing roads, with improvement of such roads if necessary. In other cases, especially in suburban areas, it may be necessary to provide, at each side of the through highway, parallel local service roads connected with the main artery at selected access points. The service roads may provide for one or two-direction travel, depending upon the amount of traffic to be served and the distance between points of access to the through highway.



A grade crossing on a four-lane rural section of the Interregional System as it would be designed in conformity with the standards proposed.

Limited Access in Cities

It is in cities and their urban fringes, however, that the problems of provision for express traffic and denial of access are most difficult, complex, and expensive of solution. As one of the interregional routes approaches a city, denial of access to it may be desirable for some distance outward from the point of first considerable development in order to discourage the further excessive extension of settlement outward. Inward from the point described, at which the first of suburban accesses should be provided, other access points should be chosen at not too frequent intervals, but so located as to serve with reasonable convenience the express highway needs of the more populous suburban foci.

Proceeding into the city proper, it is desirable that access to the highway be

(*Continued on page* 12)

State Limited-Access Highway Legislation, August, 1943*[1]

State	Year First Enacted	Designation of Facility	Authority Vested in—	Jurisdiction (by Statute) Extends to— New Highways	Jurisdiction (by Statute) Extends to— Existing Highways	Special Provisions
California	1939	Freeway	State, city, or county	Yes	Yes	Cities and counties authorized to close street or highway or make connection with freeway; local service roads authorized.
Colorado	1941	do	State	Yes	Yes	State may enter into agreement with cities and counties to further freeway development; local service roads authorized.
Connecticut	1939	Freeway and parkway.	do	Yes	(2)	For noncommercial traffic only; provision for service highways (Merritt Highway exempted) trunk line highway provisions applicable.
Florida[3]	1943	Limited-access highway (parkway or freeway).	State, counties, cities, towns, villages.	Yes	Yes	Federal cooperation provided for; marginal land acquisition and service roads authorized; consent of local units sanctioned.
Illinois	1943	Freeway	State, county, city, village, or incorporated town.	Yes	Yes	Local service roads authorized; state and counties may provide for grade-crossing eliminations; agreements with local units sanctioned.
Louisiana	1942	Freeway and limited-access highway.	State	Yes	(2)	
Maine	1939	Freeway and parkway.	do	Yes	(2)	Commercial and noncommercial vehicles to be separated in freeway. Provision for service roads; state and state-aid highway provisions applicable.
Maryland	1941	Freeway, parkway	do	Yes	Yes	May establish freeways and parkways in same manner as highways.
Massachusetts	1943	Limited-access way.	do	Yes	Yes	May establish limited-access ways in same manner as state highways.
Michigan	1941	Limited-access highway (parkways or motorways).	State, county, cities, or villages (Federal participation permitted).	Yes	(2)	Limited-access highways in cities and villages subject to municipal consent; service facilities permitted. All property rights acquired to be in fee simple; permits marginal land acquisition for such highways.
New Hampshire	1943	Limited-access highway.	State	Yes	(2)	Governor and council, upon recommendation of the highway commissioner, designate such special facilities; marginal land acquisition and service roads authorized.
New York	1937	Limited-access highway; throughway.	County (1937), State (1942) if on Federal strategic network or on throughway system.	Yes	Yes (State)	Fee to be acquired if state acquires; county resolution required; special acquisition method prescribed; special technique for state throughways.
Ohio	1941	Freeways or limited-access highways.	State, county, municipality.	Yes	Yes	May establish freeways in same manner as highways; service highways and drives authorized; court preference granted for contested acquisition cases.
Rhode Island	1937	Freeway	State	Yes	Yes	May establish freeways in same manner as highways.
Texas	1943	do	All incorporated cities and towns of more than 293,000 population.[4]	Yes	Yes	Cities or towns authorized to close streets or make provision for grade-crossing eliminations in connection with freeway.
Virginia	1942	Limited-access highway.	State	Yes	Yes	May establish freeways in same manner as highways; service roads authorized.
West Virginia	1939	Freeway	do	Yes	Yes	May establish freeways in same manner as highways.

[1] New Jersey has a "speedway" law (Revised Statutes of New Jersey, 1937, vol. 1, title 27, ch. 18, secs. 1-4) which authorizes the county boards of chosen freeholders to make rules and regulations for the use and establishment of speedways. The law says nothing about limited access.

[2] Not indicated in the statute; but this is not to be construed to mean that implied authority does not extend to existing highways.

[3] Florida enacted the model bill promulgated by the Public Roads Administration with only slight modification.

[4] Houston and Dallas are the only cities that qualify.

*From "Public Control of Highway Access and Roadside Development" by David R. Levin, Public Roads Administration, 1943.

Design and Standards of Construction, Roadside Development, and Costs; Make Plans Now

✦ HAVING established the reasons why an Interregional Highway System should be constructed and where, and the urban problems involved, (see C. & E. M. March, 1944, pg. 2) we now face the questions of design and construction, including the roadside-development features along the right-of-way, standardizing of design, and the inevitable problem of "what will it cost?".

Basic Design

After an Interregional Highway System has been designated officially, whenever the improvement or reconstruction of any section of conforming highway is contemplated, it should be built on a location and to a standard of design that will make it a fit and lasting part of the complete Interregional System that will be created by such sectional increments. This incremental construction will be carried out under various auspices. In part, doubtless, it will be built by the Federal government and states jointly; in part, by the states alone; in part by combined Federal, state and city effort; in part by state and city cooperation; and possibly in part by the completely independent initiative of cities. In its report, the Committee does not consider, under this subject, the part which counties may contribute in many sections of the country to the construction of the Interregional Highway System.

If the Interregional System is to achieve the high degree of consistency of design and utility that is desirable, two arrangements are necessary: first, there must be an agreement upon certain basic standards of roadway design and location by all authorities likely to have a share of responsibility for its construction; and, second, there must be a determination on the part of these authorities and the public that whatever work is done at any time on routes generally conforming to the selected system shall be done in accordance with the agreed standards. In no other way will it be possible to achieve the timely completion of a consistently useful and wholly satisfactory Interregional Highway System.

The Committee believes that the Interregional Highway System should provide or allow for the subsequent provision of facilities capable of serving safely and efficiently a mixed traffic estimated to exist 20 years from the date of construction. Further, all roadways should be built to carry vehicles with a maximum width of 96 inches, a height of 12½ feet, and lengths of 35, 50 and 60 feet overall, including bumpers and load, for single vehicles, tractor-semi-trailer combinations, and other combinations respectively, with axle loads of a maximum of 18,000 pounds.

The Committee defines "urban sections" as all sections of the Interregional System in or approaching a city or town and at least a mile long, along which intersecting roads or streets average one fourth mile or less apart, regardless of their location within or without the corporate limits of cities. All other sections are considered as rural sections.

The Committee considers that in all rural sections the system should be designed for safe travel by passenger vehicles at speeds of not less than 75 miles per hour, and by trucks and tractor combinations at a speed of not less than (illegible) miles per hour in flat topography. In

(*Continued on page* 44)

Massachusetts knows how little it costs to maintain ASPHALTIC CONCRETE HIGHWAYS

TOP: Rollers put the finishing touches to a hot, plant-mixed Asphaltic Concrete pavement.

BOTTOM: In addition to long life and low upkeep, Texaco Asphaltic Concrete makes a vital contribution to safe driving through its highly skid-resistant surface.

It would be hard to find more conclusive proof of the low upkeep cost of Asphaltic Concrete paving than the maintenance records of the Massachusetts State Highway Commission.

With almost 5,000,000 square yards of Asphaltic Concrete on its highway system, Massachusetts, according to the Asphalt Institute, has spent for maintenance over a period of 17 years an average of only $.0094 per square yard per year.

Compare this maintenance figure of less than one cent per square yard per year with the upkeep cost of your own heavy-duty paving for a similar period.

Upkeep cost is an important factor to be considered in making a choice between different types of pavement for heavy traffic. Certainly, the experience of Massachusetts, with its substantial yardage of Asphaltic Concrete, extending over a period of many years, should carry considerable weight.

Wherever a heavy-duty pavement is needed, it is sound practice to construct hot, plant-mixed Texaco Asphaltic Concrete. A Texaco Engineer, who is an Asphalt specialist, will be glad to cooperate with you.

THE TEXAS COMPANY, *Asphalt Sales Dept.*, 135 East 42nd Street, New York 17, N. Y.

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TEXACO ASPHALT

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Interstate Roadside Parks
Would Engender Post-War Good Will

The construction of the proposed Interregional Highway System offers an excellent opportunity to do something entirely new in the highway field in good will and good public relations. While right-of-way is being acquired for the wider highways to be constructed with dual roadways, it would be comparatively easy to add a still wider place in the road at the state boundary for an interstate roadside park.

In many states, it can be done as simply as that. In other states it must be acquired by long legal processes, but there is no reason to push aside the idea just because it offers difficulties in the acquisition of additional right-of-way. If the idea of interstate cooperation, the transformation of the state boundary into an area of which both states may well be proud and the traveler appreciative, offers a challenge to a highway department, then "where there is a will, there's a way".

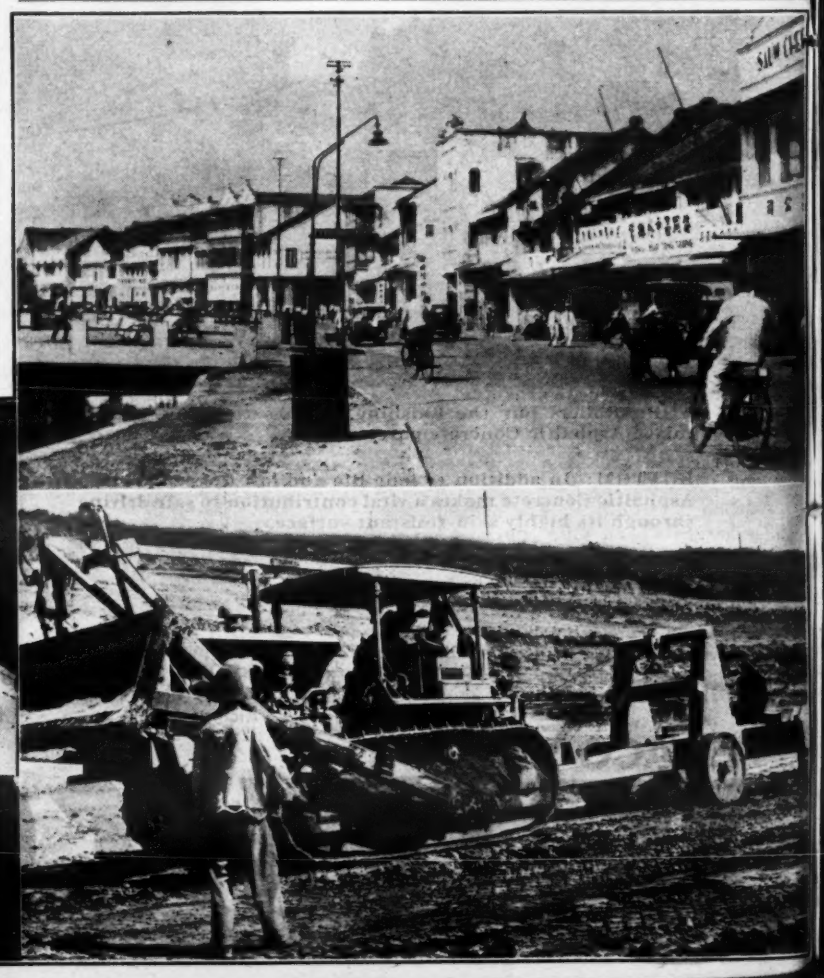
Parks of an acre or two on each side of the dual roadways in each state would provide a real "gateway of good will", with opportunities for pleasing landscape treatment in keeping with the character of the countryside, instead of the bump in the pavement and the old commercial or legal greeting of the 10 x 10-foot signboards at the state boundary. Within the park, preferably so landscaped that the various functions of its activities do not intrude upon each other, there should be provided a roomy well-built information booth where a representative of the state tourist bureau or the state highway patrol can aid the traveler in selecting his route to the city he wishes to visit or to the oustanding recreation areas or historical points.

There should also be sanitary facilities, running water either artesian or by pump, or even possibly a small domestic system with a pressure tank, picnic tables, and ample parking areas. In many of these parks trees will be available for shade, but in those localities where they are not available or will not grow, reasonably large roofed areas should be provided to protect the visitor from the sun or rain while he is planning the next stage of his trip.

In the interest of harmony, no state which has greater freedom of purchase of right-of-way, or more generous property owners at the state line, should take advantage of that and create a large and elaborate park on its side of the state border, while the adjacent commonwealth has to be satisfied with little more than a turn-out. The parks on the two sides of the state line should be to all intents and purposes about the same size and have the same general facilities. Undertaken as a cooperative effort by neighboring state highway organizations and not in the spirit of rivalry, such parks would create lasting impressions on the traveler, and pay real dividends in better public relations.

Today, when we face, for the first time in the history of this country, the creation of a highway system really worthy of the name, we can well afford to turn to the division or bureau of the highway department responsible for roadside development and say, "Here is an area at the state line for you to take and develop into something of which the state may be justly proud and which will introduce the state to the traveler in the most effective manner to create a good first impression".

So let us have many interstate roadside parks for post-war travelers! What two states will be the first to acquire the necessary extra right-of-way and announce joint harmonious plans complete for post-war contract construction?



The valiant Dutch are already looking ahead to the rehabilitation of the Netherlands Indies and a continuation of their pre-war construction program, in which American-made equipment will play its part. These scenes show the progress made in the islands before the Jap invasion. Right, a modern warehouse in Sourabaya, Java's second city. Top photo, extreme right, a street scene in the old business section of Batavia, capital of the Netherlands Indies. Such city sections were undergoing modernization, and the old bamboo bridges were being replaced by concrete and steel structures such as is seen on the left. Lower photo, a Caterpillar tractor with a LeTourneau bulldozer and a rooter on a highway job in the Dutch East Indies. **See page 19.**

Netherlands Information Bureau Photos

Committee Hearings On Highway Aid Bill

Hearings on the Federal Highway Aid Bill (H. R. 2426) were opened on February 29 by the House Roads Committee. This bill provides for Federal Aid of $1,000,000,000 annually to state highway departments for each of the first three years after the war, 75 per cent to be contributed by the Federal government and 25 per cent by the states. The cost of making surveys and plans and the acquisition of rights-of-way would be included in the cost of projects and, where the Federal Works Administrator acquires rights-of-way [illegible] the highway department [illegible] to do so, the cost incurred in such acquisition would be deductible from the Federal share of the cost of the project. Apportionment would be on the basis of one-half population, one-fourth area, one-fourth post-road mileage, and the money made available as follows: one-half for projects on the system of Federal-Aid highways, and one-half for projects in urban areas and for secondary and feeder roads. Within a state, the division between projects within urban areas and secondary or feeder-road projects would be made in the proportion which the population within urban areas and rural areas bears to the total population.

The first witness before the Committee was S. C. Hadden, Chairman of the Indiana State Highway Commission, and President of the American Association of State Highway Officials, who expressed the opinion that the appropriation will be found inadequate, since it was considered the minimum needed a year ago and in the interval highway revenues have declined while the highways themselves have deteriorated. He also mentioned the proposed Interregional Highway System, work on which would require a substantial portion of available highway funds.

Carl W. Brown, Chief Engineer, Missouri State Highway Department, and President, American Road Builders' Association, presented a detailed story of the highway problem in his state as a typical one, and said that wartime restrictions and reduced income have caused Missouri to fall behind in highway construction to the amount of $47,000,000. F. R. White, Chief Engineer of the Iowa State Highway Department, discussed secondary and feeder-road needs and suggested that any Federal funds allotted to a state for roads of this type be divided among all the counties of the state on an equitable basis. He also urged the utilization of county engineering and administrative organizations in the surveying, planning and construction of Federal secondary-road projects so that a maximum of local initiative and local control may be brought to bear on this problem.

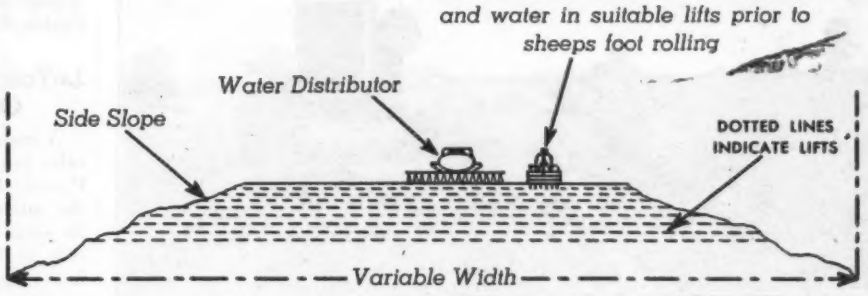
"We manage to keep working, but we've certainly had to do some improvising in the matter of replacement parts."

Half-Hour of War Could Finance Post-War Plans

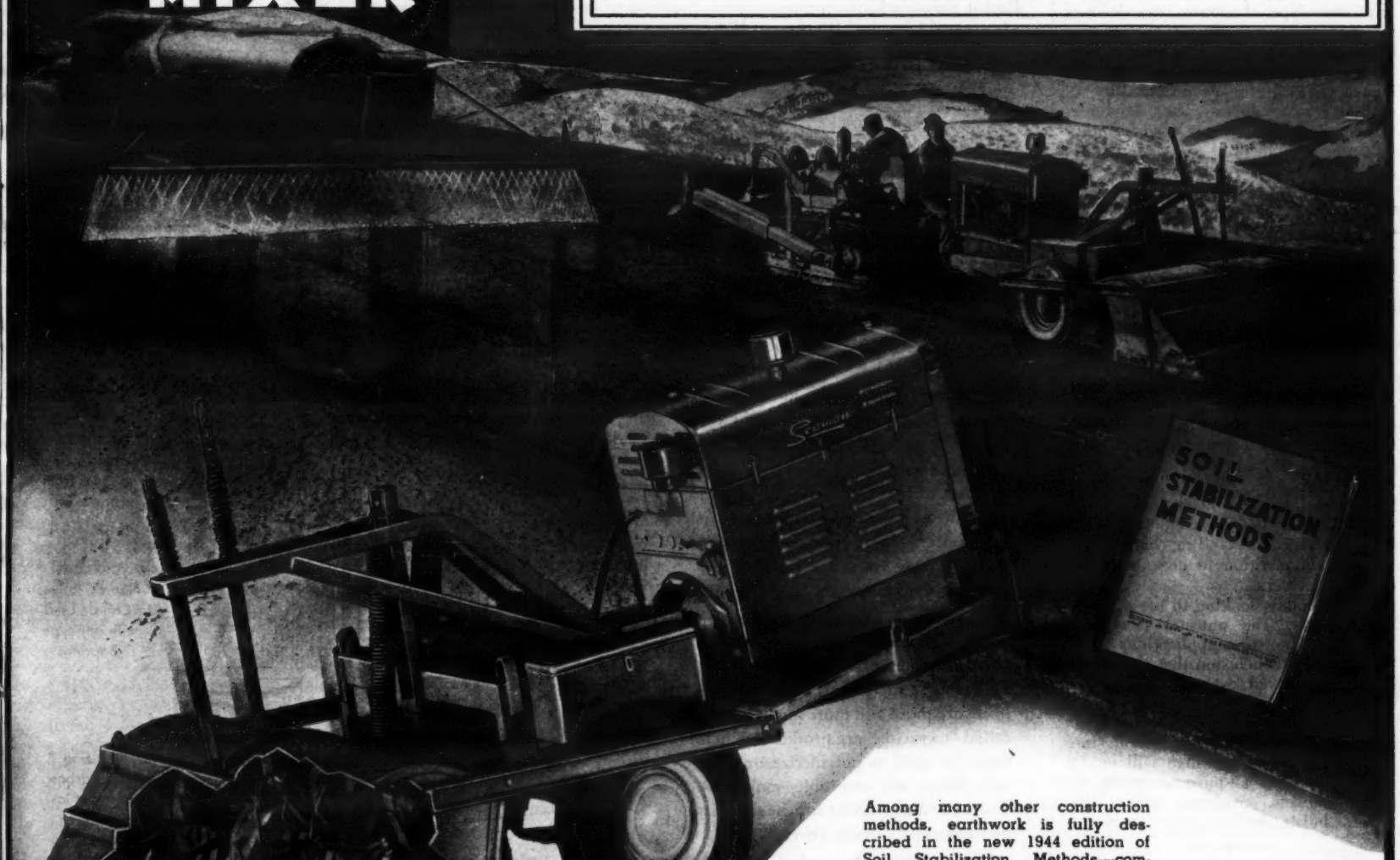
Speaking before a joint meeting of the National Sand & Gravel Association and the Ready-Mixed Concrete Association in New York City recently, Federal Works Administrator Major-General Philip B. Fleming stated that, during the half hour he was addressing the group, the United States Government had spent $6,250,000 in fighting the war. Major-General Fleming then pointed out that if Congress would appropriate a sum equal to what was spent for the war during that half hour, to provide planning assistance to the communities of this country on a 50-50 matching basis the total would pay for enough plan preparation to inaugurate $312,000,000 of public construction.

A minute for safety is better than a month for repairs.

Quicker, Better,— COMPACTION in EARTH DAMS, EMBANKMENTS, FILLS and LEVEES with the SEAMAN PULVI MIXER


SEAMAN PULVI-MIXER operating parallel to longitudinal axis of fill, mixing soil and water in suitable lifts prior to sheeps foot rolling
Water Distributor
Side Slope
DOTTED LINES INDICATE LIFTS
Variable Width

CROSS SECTION FOR FILL SHOWING OPERATION OF SEAMAN MIXER IN MIXING SOIL AND WATER IMMEDIATELY AFTER MOISTURE ADDITION THEREBY COMPLETELY LUBRICATING ALL SOIL PARTICLES. THUS MAXIMUM DENSITY IS SECURED THROUGH FULL DEPTH OF SECTION AFTER SHEEPS FOOT ROLLING. SAME PROCEDURE FOLLOWED IN COMPACTING ANY EARTHWORK CONSTRUCTION.



MODEL MHD-72

Among many other construction methods, earthwork is fully described in the new 1944 edition of Soil Stabilization Methods—compiled by Seaman Engineers. Write for your copy. Ask for Bulletin E-24

IN EARTHWORK CONSTRUCTION, the proper degree of compaction throughout the entire depth is of immense importance. A soil compacted under ideal conditions of moisture and construction techniques is more stable because it attains a higher density in which the voids cannot hold so much water that the soil becomes plastic and unstable.

Engineers report that in earth work, where the SEAMAN MIXER followed in the train of the water distributor, just prior to the sheeps foot operation, density has been increased as much as 12% over the job done with ordinary tools. The work should be done in lifts suitable to proper compaction by sheeps foot roller. (See diagram)

The SEAMAN MIXER achieves a more uniform distribution of moisture through the full depth of the treatment—which in turn means a better lubrication of all of the soil particles—a more complete utilization of the water as a film for binder effect—and, through a better, finer pulverization—an elimination of the variances in density which lumps bring about.

Earth work construction is just another place in which the SEAMAN has been described as "the most useful and the most economical unit on the job".

PIONEERED by Seaman

SEAMAN MOTORS MILWAUKEE WISCONSIN

Spring maintenance—reshaping a broken-up secondary road in Ohio.

Today's and Post-War Use of Jeep Engines

More jeep engines are now harnessed to the United Nations' war effort than any other type of motor, regardless of size or weight, according to a statement by Ward M. Canaday, President of Willys-Overland Motors, whose company designed the unit for its pre-war line of civilian automobiles. The 4-cylinder power plant is now being used in industrial war equipment as well as under the hoods of all ¼-ton scout cars in action with Allied forces throughout the world.

Security reasons do not permit the disclosure of the number of these engines that have been built into jeeps since Pearl Harbor, but more than 50,000 alone have been turned out since that date for scout-car replacements or independent power jobs. The jeep engine, in addition to its service in that versatile vehicle, is also being used to power Radar equipment, floodlights, short-wave radio sets, stationary and air-borne searchlights, arc-welding apparatus, electrically driven tools in portable repair shops, kitchen appliances, and even ice-cream mixers.

When adapted for marine use, where it also develops 63 hp at 3,800 rpm, the unit drives small landing barges and lifeboats in addition to heavy-duty underwater welders.

Mr. Canaday, looking to the post-war years, said, "The unusual success of these diverse wartime applications makes it a foregone conclusion that the engine will be employed extensively after the war for many jobs outside the automobile. Especially will it be useful in Europe's reconstruction program, since its wide horsepower range will enable it to act as an all-purpose motor for power shovels, crushers, mixers and pavers, hoists, loaders and conveyors."

R. A. Maxwell Appointed To Head Tire Sales

The B. F. Goodrich Co., of Akron, Ohio, has placed R. A. Maxwell in charge of all tire sales, with the exception of airplane tires, in the combined Automotive, Aviation and Government Sales Divisions. Mr. Maxwell, who has been on leave during the past year serving in the Office of the Rubber Director in Washington, has been associated with the B. F. Goodrich Co. for ten years, primarily in truck and bus tire sales.

Recent personnel appointments in the newly created Chemical Division of B. F. Goodrich Company are: William I. Burt, General Manager of Plants; Dr. Frank Schoenfeld, Director, Technical and Development; Dr. Victor E. Wellman, Director of Purchases; and Harry E. Foster, General Auditor.

LeTourneau Announces Own New Dealer Set-Up

A major change has been made in the sales policy of R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif., with the announcement of the formation of its own exclusive distributor organization to handle the LeTourneau line of heavy earth-moving equipment throughout the world. Plans for this set-up were completed at a recent sales conference, during which post-war problems were the chief topics of discussion.

In addition to obtaining exclusive representation for its line of Tournapulls, Carryall scrapers, bulldozers, tractor cranes and other units, LeTourneau has taken steps to establish its own organization of dealers for two other reasons. One is that the new policy will aid in the development of the Tournapull as a prime mover, and the other, that it will assure LeTourneau products an adequate sales set-up in the post-war program.

Several changes in LeTourneau sales department personnel have also been announced. Howard L. Stilley, who has been serving as Chief Field Engineer, has been named Central Sales Manager, and is succeeded by Robert D. Evans, formerly assistant. Bruce Royer, heretofore with the U. S. Engineers, Chicago Office, has become Mr. Evans' assistant. John J. Johannsen, long LeTourneau's Export General Manager, has also been named Export Assistant General Sales Manager, to advise on export sales.

Changes in district representatives include the appointment of Paul King, formerly of the Export Department, to the post of District Representative in Los Angeles; and the addition of John Ralls, of Memphis, Tenn., and C. W. Scholvin, who has been with the WPB in Washington, to the staff.

TYPICAL DIESEL LUBRICATION PROBLEMS:

1. Port Clogging

The plugging of intake and exhaust ports is frequently a factor in the operation of two-cycle Diesel engines.

Port clogging results from the combination of fuel soot with the residues of oxidized lubricating oil, which acts as a binder to plug the port openings. This clogging, of course, results in a sharp drop in efficiency.

In simplified form, the deterioration of lubricating oil in an engine involves a combination of oxygen and oil at high temperatures. As the oil continues to absorb more and more oxygen, acids called "oxyacids" are produced. These oxyacids tend to polymerize or form very large, oil insoluble molecules. These form the binder for the deposits on intake and exhaust ports.

The problem, then, of eliminating these deposits may be solved by the use of a lubricating oil properly compounded to prevent it becoming a binder. RPM DELO accomplishes this in four separate ways.

1. RPM DELO is manufactured from a carefully selected base oil containing natural inhibitors highly resistant to oxygen. It contains no heavy residues which may be left behind to act as a binder for the fuel soot.

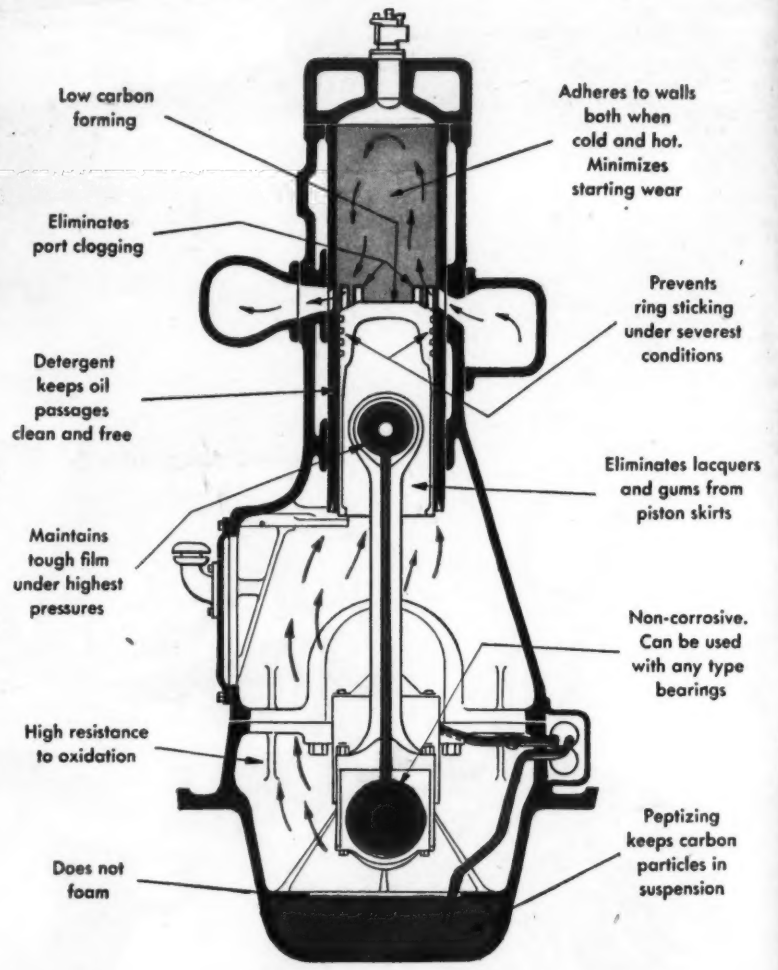
2. RPM DELO contains a powerful oxidation inhibitor, which greatly reduces the rate at which the oil absorbs oxygen.

3. RPM DELO has chemical detergent properties. The compounding material reacts with the oxyacids to render them essentially inert so that they are no longer able to polymerize to form gums and lacquers.

4. RPM DELO has peptizing properties which enable it to maintain soot and oxidation products in suspension in minute particles. This prevents these materials from settling from the oil and forming engine deposits.

The elimination of port clogging, is, of course, only one of the valuable properties of RPM DELO. It also minimizes ring and cylinder wear, eliminates ring sticking, prevents excessive deposits on rings and will not corrode bearings.

RPM DELO has world-wide distribution and is marketed under the following names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Sohio RPM DELO, and Imperial-RPM DELO (concentrate).


Low carbon forming
Adheres to walls both when cold and hot. Minimizes starting wear
Eliminates port clogging
Prevents ring sticking under severest conditions
Detergent keeps oil passages clean and free
Eliminates lacquers and gums from piston skirts
Maintains tough film under highest pressures
Non-corrosive. Can be used with any type bearings
High resistance to oxidation
Peptizing keeps carbon particles in suspension
Does not foam

Diagrammatic sketch of 2-cycle Diesel, showing the typical location of intake and exhaust ports and the advantages obtained from the use of RPM DELO.

Unretouched photo shows air ports from 1000 h.p., 12-cyl., 2-cycle Diesel streamliner locomotive after being lubricated with RPM DELO for 127,590 miles. This is typical of absence of port clogging experienced when RPM DELO is used.

RPM DELO

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. . . It FILLS all sap pores of lumber with waterproof, rosinous matter.

. . . It HARDENS the lumber, preventing deterioration.

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Lumber properly treated with *PINOLA* is the equivalent of Original Heart Pine. Twenty-six years of test prove it best. Every user of *PINOLA* is a booster. If your dealer cannot supply you write to us.

THE *PINOLA* COMPANY
Savannah, Georgia

State-Built Bridges On Key West Highway

Timber Piles in Hard Rock Driven From Floating Rig Save Construction Funds On Florida Overseas Road

✦ BECAUSE of the relatively small amount of the particular type of work and the scarcity of interested contractors, the Florida State Road Department deemed it advisable to build three of the bridges on the Key West Overseas Highway with state forces. The work was done during the summer and early autumn of 1943 as a portion of the major improvement of this 140-mile highway from Homestead to Key West to serve the wartime needs of the United States Navy. (See C. & E. M., January, 1944, pg. 1).

The bridges at Tavernier Creek and Snake Creek consist of one 42-foot concrete deck-girder span, with six 15-foot approach spans at the former and ten at the latter. The third bridge, at Teatable Key Relief Channel, consists of fifteen 15-foot spans without the long center span. In each case the long spans rest on concrete piers of substantial design, while the 15-foot spans rest on 5-pile treated-timber bents with concrete caps. The estimated cost of the three bridges was $95,000.

Pile Driving

Since all the bridges were founded on rock, not susceptible to erosion by the swift tidal currents, it was unnecessary to obtain any considerable penetration. Treated-timber piling from the Miami Wood Treating Co. was delivered in lengths of from 27 to 40 feet to the job by barge. It was driven, as was the falsework piling, by a McKiernan-Terry double-acting steam hammer, mounted in 45-foot leads on a floating steam-powered driver. To expedite handling of the barge, the piling was driven in a line parallel to the center line of the roadway, including a pile in each falsework and permanent bent, instead of being driven one bent at a time. A punch consisting of a steel shaft 7 inches in diameter with a wooden driving head was first driven to refusal into the rock, at depths varying from 3½ to 17 feet, and extracted by the driver, not without considerable difficulty at times. The piling was then inserted into the hole punched into the rock and driven to refusal. In some locations, inaccessible to the floating driver, the piling was driven by a 3,000-pound drop hammer in swinging leads on a P & H Model 400 crane.

Pier Foundations

The piers for the 42-foot deck-girder spans were likewise founded on solid rock. Bethlehem steel sheet piling was driven into the underlying rock to enclose an area slightly larger than the pier foundation. Any soft disintegrated portions of the rock bottom were removed by a clamshell bucket. The solid rock was broken up to a depth of 1 foot by the crane raising and dropping a 3,600-pound I-beam, and then was excavated by the clamshell. Then 8-inch 34-pound H-beams were driven 4 feet into the rock, not as foundation piling, but as seal anchors, six to each pier. This driving was done from swinging leads, handled by the same crane which had been used as a clamshell to clean out the interior of the cofferdam.

After the pier anchors were in place, a concrete seal was poured, using a tremie, to an elevation which made the average thickness between 4 and 5 feet. When this seal had attained satisfactory strength, usually in ten days, the cofferdam was dewatered and a footing 2½ feet thick, from which to start the pier construction, was poured.

Concrete

Rock for aggregate, furnished by the Seminole Rock & Sand Co., was delivered from Miami to the approximate center of the job by barge, there unloaded by a P & H Model 400 crane with a ⅝-cubic yard clamshell, and distributed by truck to the point of use. Sand from the Lake Wales Concrete Sand Co. of Lake Wales was shipped to Miami and barged from there to the job. The

(*Concluded on page* 20)

C. & E. M. Photo

Snake Creek Bridge is typical of the three bridges recently completed on the Key West Highway by Florida state forces.

Where will you stand if you DON'T insist on this margin of Superiority?

Big though the post-war construction boom promises to be, the signs all point to contracts awarded on the basis of narrowly figured costs. And where will you find a margin over competition if not in the equipment that turns blueprints into finished jobs? Where will you stand if you *don't insist on* the equipment with the utmost speed, economy, and dependability? That is why shrewd contractors are opening up the question of "*what* equipment?" all over again, and this time making the choice on the basis of cold and factual comparisons. If *you* do *that,* you will come out with the same answer as a growing number of other contractors. 92 years of Sullivan "know-how" is more than just a catch phrase. It means extra footage drilled, extra economies in maintenance, extra length of service...jobs finished faster. Arrange *now* to be high on a priority list that later will be crowded. . . . SULLIVAN MACHINERY COMPANY, Michigan City, Ind. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ont.

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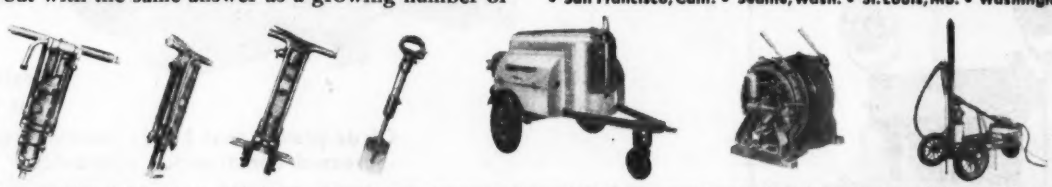

From left to right: Sullivan L-57 drill, K-81 Paving Breaker, Q-81 Sheeting Driver, M-2 Spader. Through most of the line the famous Sullivan Dual Valve is used . . . self evident proof of this exclusive feature's functional superiority.

Toughest compressor test is use in rental fleet. Choice of Sullivan Zephair Compressors by largest fleet owners testifies to Zephair's construction, design, dependability.

Power, compactness, long life feature Sullivan "Turbinair" hoists, for all construction work. Positive brakes. Oversize drums. Simple design.

Maneuverability, positive brakes, hydraulic drill positioning are some of reasons contractors prefer Sullivan Wagon Drills . . . outperforming others on every job.

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The Hector Construction Co.'s Pioneer Duplex crushing plant in its winter set-up. The company's camp is seen in the background.

Crushed-Rock Supply Produced in Winter

Winter weather failed to halt the activities of the Hector Construction Co., of Hector, Minn., in the production of crushed rock for its contract for 10.8 miles of crushed-rock base on Highway 42 between Plainview and Kellogg, Minn., according to a report in a recent issue of *Ziegler News*. This contract, which involves 1,056 cubic yards of subgrade excavation, 1,267 cubic yards of sand backfill, 6,450 cubic yards of sand fill, and 50,557 tons of crushed rock, was awarded to Hector by the Minnesota State Highway Department last autumn.

The contractor used the winter months to produce the required amount of gravel, stockpiling it for use just as soon as weather permits work on the highway. The quarry pit is located northeast of Plainview, and about 750 tons of ⅝-inch rock were produced per day.

The equipment used to maintain this production included a Gardner-Denver air compressor and Gardner-Denver S55 air drills and a B72 Buster for drilling the quarry face, preparatory to blasting; a Pioneer 38V Duplex crushing plant, powered by Caterpillar D13000 power units, and about 10 trucks. Twenty-five men are employed on the job.

Einer Nielsen, a partner in the Hector Construction Co., is Superintendent on the project, and Roy McCall is Foreman. The work is under the supervision of E. V. H. Brown, District Highway Engineer at Owatonna, and Gilbert J. Sullivan of Rochester is Project Engineer for the State Highway Department.

Oxy-Acetylene Handbook

A comprehensive and complete manual on basic oxy-acetylene welding and cutting principles and procedures has been prepared by the Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y. Durably bound, this new 600-page volume covers the entire range of oxy-acetylene processes, giving clear easy-to-follow instructions for handling all the common commercial metals, together with simple explanations of the fundamental principles of the various methods of depositing and controlling molten metal. Considerable space is devoted to an explanation of the operating principles of oxy-acetylene equipment and instructions for its care and maintenance.

Copies of "The Oxy-Acetylene Handbook", which can serve as a textbook for the training of inexperienced personnel or as a reference book for shop superintendents and others concerned with the oxy-acetylene processes for the maintenance of equipment, may be secured direct from Linde's main office in New York, or from any of its branch offices. Price: $1.50.

Post-War Planning In Massachusetts

The Commonwealth of Massachusetts now has plans for nearly 600 public works projects with which to meet the dual post-war needs for employment and necessary replacements in construction and transportation. These plans are even now beyond the blueprint stage, according to data compiled by the Massachusetts Emergency Public Works Commission, and it is estimated that the cost will exceed $25,000,000, of which about $8,000,000 will go into state highways. Towns, cities and the state will participate in this work.

Plans still in process of completion represent an additional 300 projects estimated to cost $52,000,000. These figures are based on the programs of the state and 77 cities and towns. There are 274 municipalities which have yet to report.

In discussing these enterprises, Governor Saltonstall stated that present cash surpluses will be vitally needed at the end of the war, and stressed the responsibility of the local governments to make financial provision to care for such emergencies as veterans' aid, the replacement of worn-out facilities, and public works projects, including highways and other transportation. It is estimated that the borrowing capacity of Massachusetts cities and towns is now about $100,000,000 greater than it was 10 years ago, because of debt reductions.

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Floodlight and Searchlight Units up to 14 million candlepower.

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Years ago, when internal combustion engines first came into their own for industrial duty, Clyde proved that better hoisting equipment meant lower operating costs and increased construction schedules.

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When Victory is finally won; you will again want the advantages of Clyde hoists to help solve your construction problems. We ll be glad to give you information on your future Clyde hoist now . . . there's a wide range of sizes and types . . . a hoist for every job.

Write for Bulletin K-4 for complete information on Clyde Gasoline Hoists.

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DULUTH, MINNESOTA

Sewage Works Built to Serve Civilians and Army at Air Depot

Problems in Construction Of Influent and Outfall Lines; Steel Forms Used For Most Concrete Work

+ AN auxiliary primary sewage-treatment plant designed and constructed to serve civilian housing as well as additional Army requirements at a southern Air Depot was recently completed to relieve the overload on the original sewage-treatment plant which served the entire depot. The problems of construction concerned chiefly the influent and outfall lines, built on treated-timber trestles with concrete pipe. The auxiliary plant, designed for a population of 30,000, can serve as a part of the local municipal system when and if the dormitories become a city subdivision after the war.

The Influent Line

The influent line from the housing to the plant is comprised of 27-inch plain-concrete pipe on the flat grades in the ground and 18-inch plain-concrete pipe for the steeper grade on the approach trestle. The latter has two-pile bents on 19-foot centers, comprised of piles varying in length from 20 to 25 feet above ground, braced with two 3 x 10-inch diagonals starting 3 feet above ground elevation and secured by two ¾-inch bolts.

Short-leaf yellow southern pine was specified for the piles for both the influent and outfall line. For the influent line, the piles were 11 inches diameter, 4 feet from the butt for piles 20 feet or less in length, and 12 inches for piles 21 feet or over. All trestle lumber, as well as the piles, was creosote-treated.

Each bent has a 10 x 10-inch cap, 8 feet long, which supports two 10 x 10-inch stringers 20 feet long so that there are four stringers resting on each bent. The cradle for the pipe is comprised of 4 x 6-inch transverse timbers 6 feet long, laid at 18-inch intervals, supporting two pieces of 3 x 10-inch lumber on each side of the pipe, beveled to form the supporting cradle and allowing 1 inch open space between the bottom of the pipe and the cross tie.

A ¾-inch drift pin 4 feet long runs through the outer stringers and the caps into the piles. The inner pair of stringers of each cap are held to the caps by ¾-inch bolts while ½-inch bolts are used through the cradle timber and cross-ties.

The piles for the influent trestle were driven by a 2,000-pound drop hammer in 30-foot swinging leads, handled by a Northwest crane operating on a temporary corduroy road through the swampy area.

The Outfall Sewer

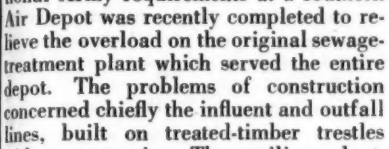
Beyond the sewage-treatment plant, the outfall sewer runs into a swamp discharging into a drainage ditch which extends 1½ miles to a creek and another 1½ miles into the river. Prior to the construction of the outfall sewer, over 3 miles of drainage ditches were blasted in the swamp area, resulting in a considerable lowering of the ground-water elevation. The outfall sewer is 530 feet long, of 24-inch plain-concrete pipe, carried on a low pile trestle with no diagonal braces. Between the plant and the trestle section is 582 feet of 24-inch pipe on a 0.3 per cent grade, while the grade on the trestle is 0.55 per cent. The joints in both the influent and outfall sewer lines were made up with G-K joint compound.

The outfall trestle is comprised of 2-pile bents 13 feet on centers, using 15-

(*Continued on page* 32)

C. & E. M. Photo

The last lap of a 2-mile 18-inch plain-concrete influent pipe to the sewage-treatment plant at a southern Air Depot is carried on a treated-timber trestle.



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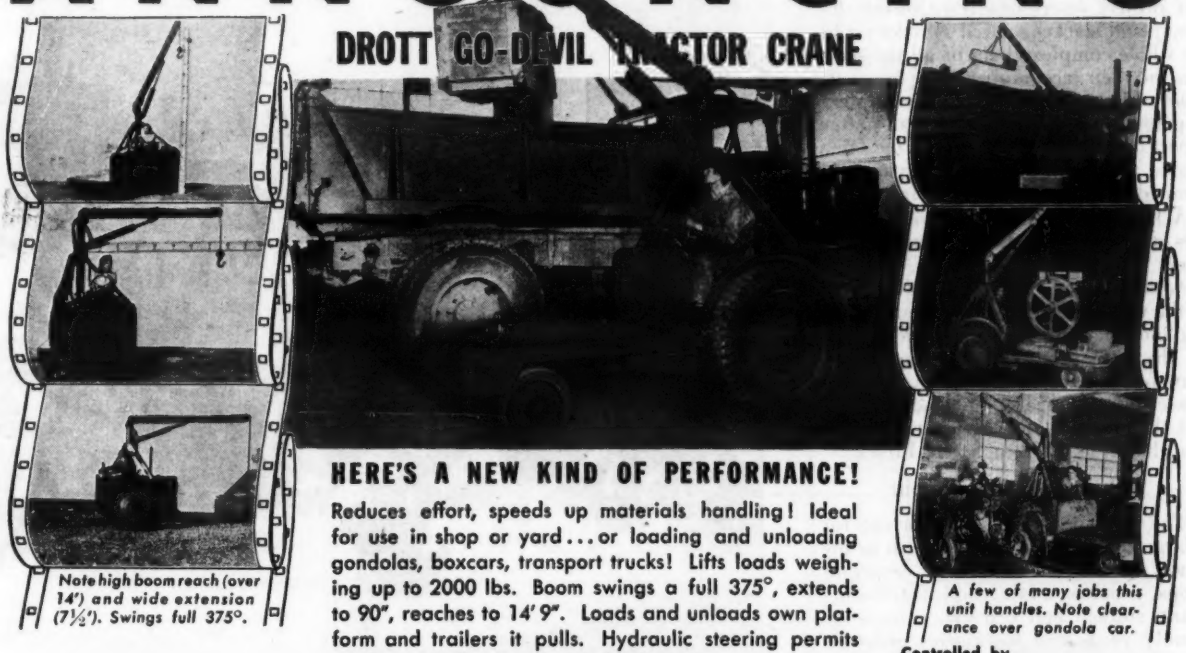

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Note high boom reach (over 14') and wide extension (7½'). Swings full 375°.

A few of many jobs this unit handles. Note clearance over gondola car.

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Smooth • Quick • Positive

Keeps dirt and air out... keeps oil in! Used successfully on Drott equipment for many years.

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Ideal for Sanitary Fill work. Digs disposal trench, compacts and covers refuse.

Gets big load quickly, carries or floats and dumps. Leaves smooth cut.

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Safety On the Job Is Up to Management

Safety Is Part of Cost On Any Construction Job; Plant Layout and Posters; Good Housekeeping

By HERBERT M. HALE,
M. Am. Soc. C. E.

✦ ON no job should the careful planning for Safety First be overlooked. In normal times an enviable record in safety is reflected in the rate charge for compensation insurance and thereby enters as an item in the cost of doing business, entirely aside from the axiom that a man hurt is an injustice to himself and the impairment of his services is an unwarranted loss to the job.

In wartime, when normal business and construction work are pushed into the background to give way to enlarged activities on a much greater scale, the same axiom holds true, yet with an added emphasis, because whatever on a large war project deters progress, lowers efficiency and slackens speed is reflected in the whole complex chain of all the services in their accomplishment for war. Safety First, therefore, becomes an item of prime consideration in the man-power aspect on the home front and to the same degree that each man's full services are counted on along the fighting front.

A large war construction project creates a huge tool but, unlike the subsequent operation of that tool, changes from day to day in the physical aspects of the work, calling for additional, shifting and often times inexperienced gangs as the job progresses. Management's plan for a safe job, therefore, has two phases: (1) the major plant set-up; and (2) the creation of the worker's realization that he is his own Safety First.

Planning a Job Layout

The main units in a plant layout for a large construction project, such as the power house, machine and carpenter shops, concrete mixing and distributing plant, storage belt conveyors, mass assembly yards and workmen's quarters, constitute the manufacturing tools, so to speak, for the job, in use over all or a greater part of the duration of the work. In the planning of these items on one particular undertaking of large scope, a study was made with the idea of incorporating, as far as possible, sound safety measures, to be built into the structures mentioned.

Since the working time was spread over the full twenty-four hours, adequate lighting at all times was provided, with special emphasis on the elimination of heavy shadows in critical places. Headroom and aisle room are essential for the rapid moving about by plant workers. On this project due care was given to guarding all aisles, passageways and platforms with solidly built fencing, braced in all respects and embodying a sanded smooth hand-rail. Wherever possible, operating machinery was remote-controlled, sufficiently supplemented by signal lights and telephones to insure coordination in a definite procedure.

Stairways, of course, become the common highways for men of all gangs in and out of the plant and so received almost first consideration in planning for safety. Where exposed to weather, a step worn and soggy from moisture becomes one of the greatest hazards on any job. It has many times happened that when workmen for the first time used stairways built true with an 8-inch rise and 10-inch tread, with each step and platform fully covered by cast-iron safety treads, they noticed these conditions, becoming conscious that definite planning had been done for their own benefit. It is the stair then that first reacts psychologically for the benefit of the men, the job and safety and leads to the appreciation of all other details that form a part of a planned safety program.

Long ladders leading to high forms and stagings, built of substantial lumber with rungs dapped into the side stringers, are best made of three stringers with long stout rungs and railings to allow separate up and down use on the same ladder. This type has many advantages when work gangs change shift aloft. Such ladders, with their heavy construction and equipped with an attached platform at the top, must be set in key places by cranes which can retain their hold on the ladders until suitable footing supports and upper fastenings are made. The advantage in safety over any lighter man-handled types is obvious.

A well organized clinic is the first

(*Concluded on page* 38)

Mr. Hale, author of this article, has had a long and successful career as Project Manager of subway and tunnel projects in the East, including one of the largest Navy projects started before Pearl Harbor. He has developed safety first on his jobs to the point where each worker is conscious of his responsibility for the safety of all.

Official U. S. Army Signal Corps Photograph

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(Write for "The Service Factor"—published periodically and devoted to the solution of lubricating problems.)

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FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Bulletin Describes Units For Winter Maintenance

State and county highway officials with an eye to next winter's snow and ice storms will be interested in an attractive folder on Champion snow-removal and ice-control equipment just received. A variety of plows are illustrated, showing the shovel-blade, tapered-blade and reversible-blade types for all purposes from the small sidewalk size for teaming up with a small wheel-type tractor to the large V-plows of the "drift-busting" and high-speed varieties. A tabulation of specifications is included, with recommendations for sizes of truck to be used with each snow plow. The catalog also shows various types of spreaders for laying sand, salt and other abrasives for ice control, with particular emphasis on the new streamlined Berna spreader.

For copies of this folder, write to the Good Roads Machinery Corp., Kennett Square, Pa., and mention this publication.

P & H "Shovel News" Will Be Continued

Shovel owners and operators will be interested in a recent announcement that P & H "Shovel News", featuring important activities and developments in the excavating field, will be continued during 1944. A feature of this publication is its large photographic reproductions of on-the-job scenes.

Copies of current and future issues of this pictorial news bulletin may be secured upon request to the Excavator Division, Harnischfeger Corp., 4419 W. National Ave., Milwaukee 14, Wis.

Pan-American Road Congress

The Peruvian Government has named a committee to organize the Fifth Pan-American Highway Congress to be held in Lima, Peru, during the latter part of July, 1944. The last session of the Congress was held in Mexico City in September, 1941.

HERE'S PROFITABLE PLANNING HELP FOR YOU

LeTourneau rigs have literally hundreds of profitable uses. To help you determine where they fit into your work, we've developed this chart of major and secondary applications. Study it. If you're not using LeTourneau rigs on the checked applications (every one proved practical by actual use), see your LeTourneau dealer.

..STUDY THIS CHART ..SEE WHERE LeTOURNEAU EQUIPMENT CAN HELP YOU MAKE MONEY ON EARTHMOVING AND MATERIALS HANDLING

★ MAJOR APPLICATIONS
● SECONDARY APPLICATIONS

	CONSTRUCTION										GOVERNMENTAL			RAILROADS		INDUSTRY		
	EARTHMOVING	BRIDGE	PAVING	HIGHWAY	LEVEE	BUILDING	PIPE LINE	FEDERAL	STATE	COUNTY	TOWNSHIP	CITIES	CONSTRUCTION	MAINTENANCE	OPERATION	FACTORIES	DOCKS & WHARFS	COAL HANDLING
SUPER C TOURNAPULL** (Capacity-15 heaped yards)	★		●	★	★			★	★	★		●	★				★	
SUPER C TOURNACRANE** (Lifting Capacities up to 20,000 lbs.)	●	●	●	★		★	★	★	●	●		●	●	●	★	●		
SUPER C TOURNATRAILER** (Capacity-17 heaped yards)	★		●	★	★	●	●	★					●				★	
MODEL D TOURNAPULL† (Capacity-2.3 heaped yards)	●		★	●				★	★	★	★	★	★	★			●	
MODEL D TOURNACRANE† (Lifting Capacities up to 10,000 lbs.)			★	●		★	●	★	●	★	★	★	●	●	★	★	★	
MODEL D TOURNATRUCK† (Capacities-5 tons)	●		★	●		★	●	★		★	★	★	●		●	★	★	
POWER CONTROL UNITS (for all "Caterpillar" tractors; Allis-Chalmers L, L-O, HD-10, HD14, S, SO; International TD40, TD18, TD14, Cletrac FD, FG, DD, DG, CG)	★	★	★	★	★	●	★	★	★	★	★		★	★	★	★	★	★
CARRYALL SCRAPERS (for all tractors fitted with PCU's)	★	●	●	★	★	★		★	★	★	★	●	★	★				★
ROOTERS (for all tractors fitted with PCU's)	★			★	★		●	★	★	★	●		★	●				
TRACTOR CRANES (for all tractors fitted with PCU's)	●	★	●	●		★	★	★	●	●		●	●	●	★	★	★	
DOZERS (for all "Caterpillar" tractors)	★	★	★	★	★	●	★	★	★	★	●	●	★	★	★	●		●
SHEEP'S FOOT ROLLERS (for all tractors)	★		★	★	★			★	★	★			★					

Don't take a chance of going into the "red" with slow, out-dated equipment on your postwar projects. Ask your LeTourneau dealer how the rubber-tired power of Tournapulls and the big capacity of LeTourneau rigs can get your jobs done faster and put more money in your pocket. See him NOW.

**15-yd. Carryall Scraper, 17-yd. Tournatrailer and Tournacrane (20,000 lb. lifting capacity) interchangeable on same Super C Tournapull prime mover.

† 2.3-yd. Carryall Scraper, Tournacranes (4,000 to 10,000 lbs. lifting capacities) and 5-ton Tournatruck interchangeable on same Model D Tournapull prime mover.

LETOURNEAU
PEORIA, ILLINOIS STOCKTON, TEXAS

LeTOURNEAU (Aust.) Pty. Ltd., Rydalmere, New South Wales, Australia.

Limited Access Proposed For Interregional Highways

(*Continued from page 2*)

provided only at selected cross streets. These should preferably be streets that cross the city or extend at least to the next adjacent express highway without interruption, in order that they may serve as clear and direct connections with the express route for as large a territory as practicable.

The usefulness of the express route for intraurban traffic is greatest for traffic between the outer residence areas and the city center. For this reason, access points should be provided at shorter intervals near the city limits than near the center. Proceeding toward the center, a point is reached at a substantial distance from the route terminus, say not less than a half mile nor more than a mile, between which and the terminus there will be no occasion for further access. Within this distance traffic to the city center can be accommodated more conveniently on the ordinary streets than on the express highway.

At least at the access streets, safe provision for intersecting traffic should be made. In the opinion of the Committee, this will invariably require the separation of intersecting grades. As necessary, other selected streets may be carried over or under the express highway, without access to it. All other streets should be terminated at the parallel local service ways which, in cities, will always be required. To avoid undue obstruction of the cross movement of pedestrians, foot bridges, should be constructed to span the express ways at frequent intervals.

Generally in the largest cities, and under some circumstances in smaller cities, a satisfactory meeting of the conditions imposed, especially near the city center, may require the raising or lowering of extended sections of the interregional route above or below the adjoining ground level, in order to carry it over or under frequent cross streets or over some and under others.

The effort to crowd an elevated highway into the narrow space generally afforded by existing surface streets will usually result in unsatisfactory design of the express route and impairment of the utility of the surface street for local service. Generally, it will also cause serious damage to abutting property. To avoid these undesirable consequences, it will usually be necessary to acquire a right-of-way wider than can be found within the limits of an existing street. This may be done by taking the added width at one side of a street; or a more feasible location, avoiding the taking of property frontage, may be found at the rear of properties fronting on adjacent streets. In general, the Committee considers elevation of the express routes a solution acceptable only in a commercial or business environment. It shares what it believes to be a widely held opinion opposing the cutting of such facilities through residential areas.

Depression of the express route will usually require extensive reconstruction of underground facilities, such as water mains, sewers, and electric conduits; and at low elevations drainage may be difficult and expensive. It will rarely be possible to achieve full depression within the width of an existing street. Additional right-of-way acquisition will nearly always be involved.

Where the difficulties of depressed construction can be overcome, the resulting development may be considered more pleasing to the eye and more consonant with a gracious improvement of the urban environment than any other solution of the express-highway problem. Wholly satisfactory design will usually require condemnation of a block-wide strip of property through the city, retaining the existing surface streets at the two ends of the block as local service ways.

In the outer and residential sections of large cities and in small cities generally, neither the elevation nor the continuous depression of express routes is recommended. In such sections a more appropriate design, developed on a block-wide right-of-way, may utilize the existing surface streets at the two ends of the acquired block without change in local service ways.

Except in the largest cities, it will probably not be necessary to extend express routes through the central business section. In the first place, it may usually be assumed that substantially all of the traffic approaching the business section of a city is destined to that area, and will be discharged at its fringe, there to enter the central street system or a parking garage. In the second place, city-penetrating express routes, where they extend continuously across a city, can generally be located tangentially to the central business area. If and when it is necessary to extend an express route through a central business area, elevated or tunneled locations will usually be the more appropriate choices.

Legal Aspects of Limited Access

The greater right-of-way requirements for limited-access highways present more serious difficulties than the design of ordinary main highways; and the present lack of specific legal sanction for the establishment of limited-access highways is a positive obstacle in many states.

While there is a dearth of judicial opinion on the question of the abutting owner's right of access to newly created highway facilities, unless there is a reversal of judicial doctrine in many states the owner of abutting property is likely

(*Continued on next page*)

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Teeth set wide out at the corners of the lip enable PMCO Welded Dippers to take a wider bite that assures a fully loaded dipper.

This efficient wide set corner tooth location is possible only with a solid manganese steel front. The strain imposed by wide set corner teeth would break up a front of rolled sections or plain carbon steel.

Pettibone Mulliken engineers believe that efficiency in operation and strength in power shovel dippers should not be sacrificed by using cheaper materials to meet a price.

Right-of-Way Acquisition For Highway Improvements

(*Continued from preceding page*)

to possess the same right of access to new roads as he has with respect to old established highways. The theory seems to be that the proprietary right of access of the abutter accrues as a matter of law the moment the new facility is opened to traffic. Granting that the doctrine of accessibility is logical in the case of existing highways, it seems unreasonable with respect to new through-traffic facilities. Yet, the concept of limited-access highways to facilitate the efficient movement of through traffic is of such recent emergence that the judiciary has not had the opportunity to endorse or reject it on its merits. It may well be that a crystallization of public opinion will constrain the courts to take a liberal view of the matter.

As shown in the table on page 2, there are only seventeen states that now have on their statute books laws specifically sanctioning the establishment of limited-access highways. Bills designed to accomplish this purpose, which were introduced during the recent sessions of legislatures in four states, (Arizona, Delaware, New Mexico, and Utah) failed of passage.

In the absence of a law clearly establishing the power of appropriate public authorities to create limited-access highways, an attempt, by negotiated compensation, to restrict abutters' rights of access to any section of existing or new highway could be obstructed by any unwilling abutter and probably by any other opposing individual or group. Without such a law, the power of public agencies to extinguish private rights of access by condemnation would be in doubt, and authority for the expenditure of public funds in compensation for such rights would be equally in doubt.

In ten of the existing limited-access highway laws the state alone is given authority to establish such facilities. Since the necessity for limitation of access arises mainly in connection with the service of extraordinary volumes of traffic in and near urban centers, it is highly desirable that the power to create and participate in the creation of limited-access facilities be extended to city and county highway authorities, as provided by the recommended model bill in "Public Control of Highway Access and Roadside Development" by David R. Levin, Public Roads Administration, 1943.

Right-of-Way Acquisition

The greatest single impediment to the timely realization of desirable road improvements has been the difficulty of acquiring the necessary rights-of-way. Too often in the past the character of road improvements undertaken has been governed by the limitation of short-sighted land-acquisition measures. When the acquisition of land is postponed, as usually it has been, until the very moment of need for construction purposes, it is often discovered that the land actually wanted cannot be obtained without long delay. Time pressing, plans are altered to require less or more-available land and in the end it is often found that for such inadequate takings too much has been paid. Every condition leads to ill-advised and uneconomic compromise.

The causes of these conditions are mainly two: one, the failure to plan and provide funds for land purchases sufficiently in advance of the occasion for road construction, and the other, the cumbersome and time-consuming land-acquisition processes prescribed by the laws of most of the states. If work on the Interregional Highway System is to supply the post-war employment of which it is capable, and if design of the system improvements is to be unwarped by right-of-way compromises, both of these causes must be clearly recognized and remedied.

The Federal Government has already made provision in the Defense Highway Act of 1941 and the recently enacted Public Law No. 146—78th Congress, for the survey and advance planning of highway construction projects. This provision can be and is being employed for planning improvements on routes conforming to the Interregional System. With similarly adequate planning provision by the states and their subdivisions, the further need to remedy the first of the causes mentioned is the early and sufficient appropriation of immediately expendable funds for acquisition of the necessary lands and rights-of-way. For this purpose the amendment of the Federal Highway Act by Public Law No. 146 is ineffectual.

A complete remedy for the second of the causes referred to will require the more difficult revision of legally established methods of public-land acquisition in many states. In 55 jurisdictions examined, the Committee has found that there are no less than 320 such methods in present use, with nothing inherent either in the nature of the governmental units exercising the power or in the public uses for which lands are acquired to require such varied treatment. The common defect of the majority of these varied methods is that they postpone the public possession of required lands until the compensation due private owners has been determined by processes which involve many possibilities of legal delay and obstruction.

Fortunately, however, there are among the methods in use a few, recently developed and closely similar in their essential requirements, that avoid these delays and yet afford ample protection to the rights of private-property owners. Where these methods obtain, the condemning public authority, following required preliminaries, simply files a plat and description of the property to be acquired, and after notice to the owner of such action the appropriation is complete and title to the property vests in the state. If offers of the condemner are then rejected, the former owner must file a claim for the value of the property with the State Court, which makes an award after hearing all the evidence.

The Committee recommends the general adoption of procedure of this type. In the absence of some such provision, development of the Interregional System will inevitably be subject to long and costly delays and litigation, and public benefits of the needed facilities will meanwhile remain unrealized.

New vs. Widened Rights-of-Way

To convert existing highways to conformance with standards appropriate for the proposed Interregional System will require much revision of alignment and in many sections a substantial

(*Continued on page 36*)

PHOENIX CONS. CO., BAKERSFIELD, CALIF. *reports:*

"In competition, we were able to mix in one passover the same amount of materials that the other types had to mix in three passovers.

"On a job for the Division of Highways from Blackwell's corner to the county line, we mixed 7920 tons in 20 hours mixing of imported materials.

"The outstanding feature of this machine is that the oil pump is synchronized with the forward movement of the machine which insures a uniform mixture regardless of the speed at which the Road Pug is moving. Another is the fact that an inexperienced man can be taught to operate the Road Pug in a half day's time.

"Our satisfaction with the Madsen Road Pug is reflected in the fact that we have purchased three of these machines, and all three are in operation by this Company."

. . . MIXED WITH A MADSEN ROAD PUG *in a single pass*

NO CONTRACTOR with an eye to the future can afford to overlook the high production speed of the Madsen Road Pug—it's the highest capacity travel-mix machine on the market. Has a capacity ranging from 200 to 550 tons per hour . . . pumps road oil at a rate of 9000 to 12000 gallons per hour . . . travel-mixes at a speed of 5 to 40 feet per minute . . . and replenishes the road oil without interrupting production.

The Phoenix Cons. Co., reports that they produced 7920 tons in 20 hours for the California Division of Highways. That's 396 tons per hour and 6.6 tons per minute in a single pass mixing operation to Calif. State Highway specifications. It's the kind of mixing others talk about and which the Madsen Road Pug delivers.

You can't afford to overlook this profit-maker; read what the Phoenix Cons. Co. thinks about the Road Pug and write for the new Road Pug catalog today. No obligation of course.

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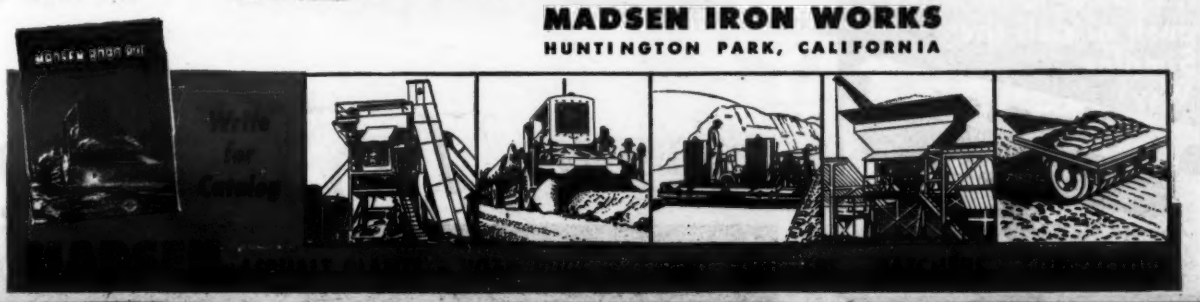

An 18-yard Daniels E-Z-Load scraper pulled by an International T-18 tractor, with a Caterpillar D7 serving as a pusher.

New-Design Scraper For Quicker Loading

The Daniels E-Z-Load scraper, manufactured by the Winston Mfg. Co., Nashville 2, Tenn., has a new patented movable-bowl design which, it is claimed, gives a better peak load with a saving in tractor power and time and provides uniform spreading.

The loading is started with the bowl in a forward position, then a backward rocking movement of the bowl creates a hole in the center of the material into which loading continues. The bowl is again rocked forward, compacting and leveling the load and reducing voids. This backward and forward movement is continued, pushing the material further up in the apron for a bigger load. Continuing of the rocking motion of the bowl breaks down lumps of earth, assuring a smooth and continuous spread with complete dumping of the load.

Five models of this scraper are available: one, Model 1826, has a heaped capacity of 25 cubic yards, struck capacity of 18.3 cubic yards, and an apron opening of 65 inches; Model 1418 has a heaped capacity of 18 cubic yards, struck capacity of 15 cubic yards, and an apron opening of 56 inches; Model 1215, a heaped capacity of 15 cubic yards, struck capacity of 12.1 cubic yards, and an apron opening of 70 inches; Model 811, a heaped capacity of 11 cubic yards, struck capacity of 8.3 cubic yards, and an apron opening of 44 inches; and Model 45, with a heaped capacity of 5 cubic yards, struck capacity of 4.1 cubic yards, and a 48-inch apron opening. Tractor power recommended is 95 hp, 80 hp, 70 to 80 hp, 70 hp, and 60 hp respectively.

Further details on Daniels E-Z-Load scrapers, hundreds of which have been working on Navy off-shore bases and for our armed forces during the past few years, are contained in folders which will be sent by the manufacturer on request and mention of this item.

Pan American Highway Gaps Are Closing Up

Before long it will be possible to travel an uninterrupted 10,000 miles along the Pan American Highway from the Gulf of Darien in northeastern Colombia to Buenos Aires, according to a recent report from the Office of the Coordinator of Inter-American Affairs. In fact, since there are already roads south of Buenos Aires to the Straits of Magellan, the entire length of South America will soon be available to continuous motor travel.

The principal gaps in the South American section of the Pan American Highway are in Ecuador where 235 miles, much of it in mountainous country, remains to be completed. Construction here is being rushed, in some instances construction crews proceeding from both ends of a given sector. The final 79-mile gap is between Las Chinchas and Macara, on the Peruvian border, and from there on the Pan American Highway is open, without detours or ferrying, through Peru and Chile to Buenos Aires.

Waterproofing Agent For Most Soil Bases

A specially treated resin with chemicals added has been announced by Hercules Powder Co., Wilmington, Del., for waterproofing soils. This dry powder, called Stabinol, is easily mixed with soil of about 85 per cent optimum moisture by the standard equipment used for stabilization and soil-cement operations. Stabinol replaces Vinsol resin and is produced by an entirely new process.

From 1 to 2 per cent of Stabinol is required to waterproof soil. This means from 4 to 10 pounds per square yard, averaging 5 pounds, for a 6-inch depth. The new waterproofing agent will work with a large variety of soils, except the heavy clays, but works best with soils having about 10 per cent of clay binder.

Hercules offers this new material for waterproofing secondary and farm-to-market dirt roads to increase their service by keeping them from becoming seas of mud, and for waterproofing the dirt subgrade or bases for any type of paving on highways or runways, and as a construction expedient to protect the surface of a new grade, which must be left for a considerable period before paving, to prevent the absorption of more water.

Stabinol and other types of resin stabilizers developed by Hercules have been used by city and state highway departments to treat roads in Delaware, Florida, Georgia, Mississippi, Ohio and South Carolina. Soil has been stabilized by this method on projects under the supervision of the U.S. Army Corps of Engineers in Alabama, Massachusetts, Mississippi, Missouri, North Carolina and Virginia. Resin stabilizers have been used by the Navy Department on projects in Florida, Mississippi and South Carolina.

Engineers of Hercules Powder Co. report that the cost per square yard for waterproofing a roadway base with Stabinol is about 30 cents for a 6-inch depth, divided equally between the cost of Stabinol and the cost of processing. Complete information may be secured direct from Hercules.

SCORE
WITH McNAMARA CONST. CO.
Lorains 27

IT'S a fact! The McNamara Construction Company, Toronto, Ontario, has bought 27 Lorains—including shovels, cranes, draglines, and backdiggers. These Lorains were purchased at different times—over a considerable stretch of years.

Repeat orders, in volume like this, are not based on sentiment. They're based on past experience . . . on actual performance records of Lorains on all kinds of jobs, under *all sorts of conditions.* We think you'll agree that 27 "repeats" by a single company is pretty conclusive evidence of Lorain ability to work most any type of job—at a profit to the owners.

That's why—when planning your postwar equipment setup, you owe it to yourself to get the full story on Lorains from your Lorain distributor. There's one nearby. You may find that his recommendations will mean big money to you on postwar jobs that come your way. So, see him soon.

THE THEW SHOVEL COMPANY • Lorain, Ohio

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It's easier to lift, lower, push or pull the Simplex Way!
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Departments Combined For Greater Efficiency

Montana Hwy. Commission Puts Construction and Maintenance Under One Engineer; Post-War Plans

♦ IN the belief that highways which are designed, built, and maintained by the same division of a highway department will be better built, with an eye to their future upkeep and cost, than by a separate division of the department whose responsibility ceases with state acceptance, the Montana Highway Commission has reorganized its construction and maintenance departments under a single head. This reorganization, contemplated for some time, became operative only last October but is expected to prove both economical and efficient. Ray Percy, who has been with the Montana Highway Commission for many years, was selected for the position of Maintenance and Construction Engineer. Under the revised set-up, there are four principal assistants in the central office, a bridge construction engineer, a road construction engineer, a maintenance engineer, and an office engineer. Inasmuch as construction is now practically at a standstill, these positions are not all definitely and permanently assigned and the present incumbents also handle other duties.

The same plan for combining construction and maintenance operations under one responsible head has been extended to the ten district offices which are located and supervised by the district engineers as follows: Butte, Fred Quinnell; Great Falls, F. A. Small; Billings, R. J. Ephland; Wolf Point, R. L. Ewing; Missoula, H. C. Tilsey; Kalispell, Ray Spurzein; Havre, A. G. Middleton; Miles City, S. B. Sanders; Lewistown, J. P. McGhee; Bozeman, Fred Brown.

Each of these district engineers is considered to be entirely competent to handle both phases of the work so that the combination of duties required no reorganization in the district offices.

Bridge design will still be handled by the central-office design section but construction will be under the supervision of the new combined department.

The ten district shops where normal operating repairs are made to maintenance equipment and the central shops which do major repairs and overhauls are operated under a new department headed by R. A. Stephenson, Equipment Engineer, although the district engineers will continue to exercise some control.

Maintenance Operation

From a highway system of 1,661 miles in 1928, of which 1,301 miles were gravel and only 14 were asphalt-surfaced, the Montana system has grown to 5,240 miles in 1943, with 4,537 miles of bituminous surfacing. Despite the difficulties of maintenance under wartime equipment and personnel shortages, it has been impossible greatly to curtail operations in Montana. Particularly in the western part of the state, where many miles of bituminous roads were constructed on bases which later experience proved to be inadequate and unsatisfactory, it is necessary practically to rebuild considerable stretches of these roads when the spring thaws have severely damaged them.

Although the Highway Commission restricts loads during the spring months from the normally permitted limit of 600 pounds per inch of tire width to 400 or even in exceptional cases to 200 pounds, great damage occurs each spring, and heavy maintenance operations, amounting substantially to replacement, are essential. Adherence to these reduced load limits, which is generally very good throughout the state, has of course been complicated by the demands of wartime freight movement resulting in even heavier damage than usual.

Maintenance forces of the Montana Highway Commission are working constantly to eliminate frost-boil conditions from state highways.

The burden on the maintenance department is increased by the fact that the normal annual program, under which some 200 miles of highways are built, has been seriously curtailed and it is felt that maintenance costs will continue to increase, eventually reaching an unbearable maximum, if normal replacement and betterment programs have to be dispensed with.

Three Cedarapids screening and

(*Continued on page 82*)

Standard Portable Paving Plant is assembled of interchangeable Standard Units. These can be used for bulk cement plants, aggregate production plants and batching plants.

The Standard Subgrader is built to perform the whole job of preparing the subgrade *without follow-up*. Rock as large as 14", mixed with the subgrade dirt, has been successfully handled.

When comparing performance records of batching plants, owners say Standard's simplicity, accuracy, reliability and freedom from mechanical, electrical or other operation troubles surpass all other types of cumulative weighing systems.

The Standard Finisher has several exclusive features. Special construction at the ends of grading blade eliminates wear on surface of side forms. Edging attachment eliminates waste and hand finishing costs.

Improved Equipment! New Equipment! *Distributors throughout the country!*

Here at Standard Steel we are working "around the clock" on war production. Nevertheless, we believe it a patriotic duty, as well as a practical necessity to plan now for tomorrow. Post-war demands in the construction field will call for ready and effective equipment. Standard will be "on top" of these demands with an augmented, well-engineered line of construction equipment. Added to our already long line will be new equipment built with Standard exclusive features. Standard Steel products have long been dominant in the West. Contractors and distributors, *wherever they may be,* should find out about this company's sturdy, well-built, economical equipment and their plans for tomorrow.

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Simple, Dependable, Rugged... the choice of leading contractors everywhere. Write for literature and prices.

STERLING MACHINERY CORP
405-13 Southwest Blvd Kansas City Mo

Preparation of Base For Hot-Mix Runway

(*Continued from page 1*)

D8's. The fill was bladed to a crown of 1 per cent or 2½ feet in 250 feet, using four power graders and two pulled graders for finishing off the surface.

The grading was carried 125 feet on either side of the 500-foot runway for shoulders, which were fertilized with muck from ponds excavated on the site and later sprigged to hold the sand and dust. In one pond it was necessary to remove 15,000 cubic yards of muck which had a maximum depth of only 4 feet. This was done with draglines and the muck loaded to Euclids and hauled to the shoulders.

Drainage for the area was provided by reinforced-concrete pipe from 15 to 42 inches in diameter. The trenches, from 6 to 10 feet in the deepest sections, were excavated by draglines and opened wide because of quicksand which flowed in as soon as the trenches were dug. The excavation was carried slightly below grade and the quicksand allowed to come to rest and set. Then the material was covered with the fine impervious sand from the top, to bring the bottom of the trench to grade, and tamped, obviating the need for cradle construction for the drainage lines. The pipe was all set by a traveling crane run along the side of the trenches. Only three of the lines were laid in deep trenches, the balance being close to the surface. All drainage lines under the taxiways were encased in concrete.

Stabilizing the Subgrade

In order to provide a satisfactory foundation for the new runway, the subgrade was stabilized with Ocala lime rock from six or more sources which shipped in as many as 105 cars a day during the height of the work. This rock was processed at the quarries to have a maximum screen size of 3 inches down to dust. It was unloaded at the site by five 1-yard clamshells on two Koehring, one P & H, one Northwest and one Bay City cranes, all loading to a fleet of 30 to 50 trucks. The stabilization was carried on over the areas that were ready, that is, where the grading was complete, without respect to the location on the runway. In this manner it was possible to carry on the work almost continuously, dodging areas where additional grading or the removal of muck pockets was in progress.

The lime rock was dumped in windrows along the runway and then knocked down by a bulldozer to 3 to 4 inches deep. The depth of the spreading was checked by boring tests, and then the lime rock was mixed with the subgrade material to a depth of 6 inches, using a 24-inch disk plow, with controls to prevent it digging in to a deeper furrow, and pulled by a D6 tractor. The area being worked was then cross-disked continuously by a 16-inch disk harrow until the mixture was homogeneous.

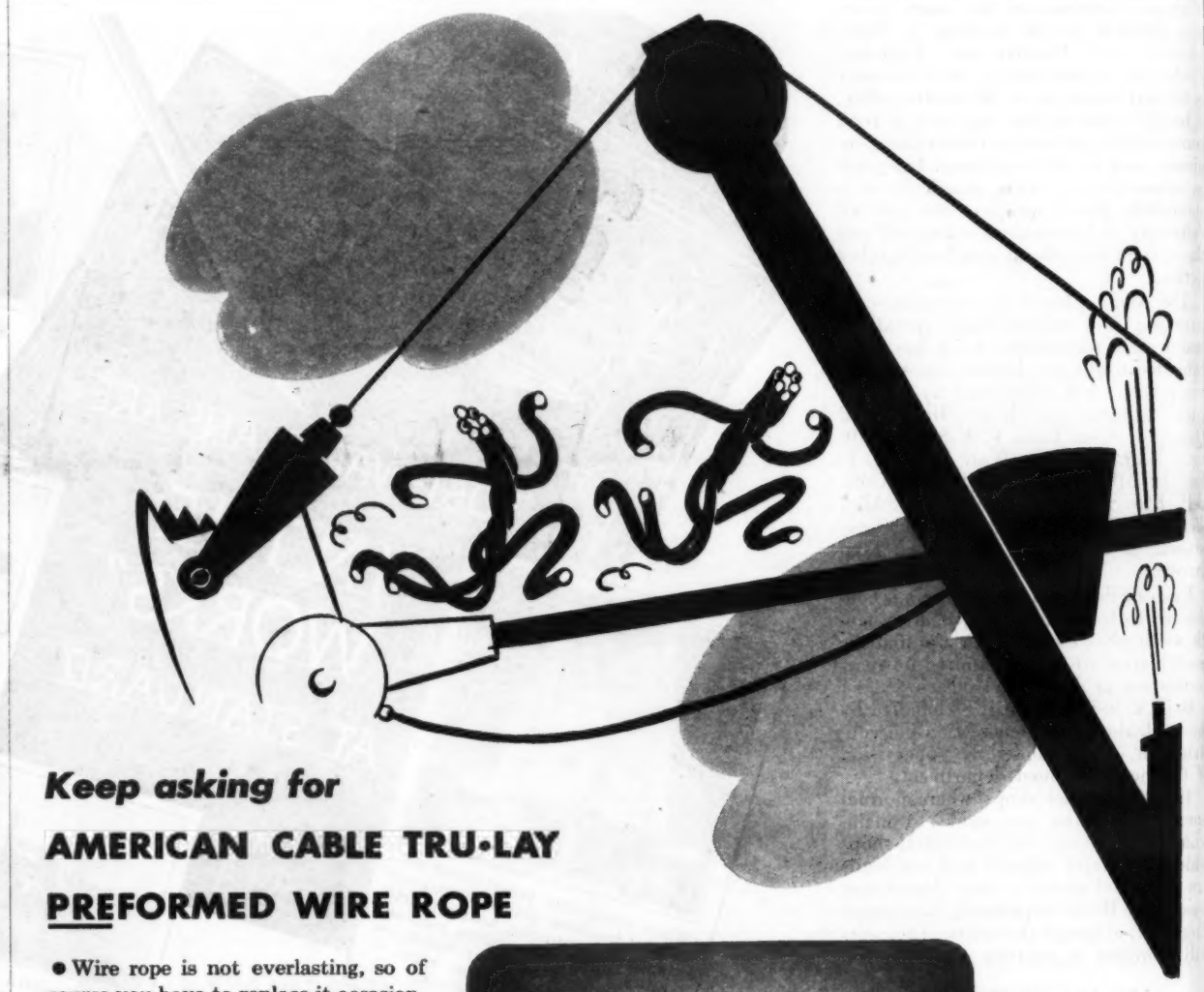
The fleet of two Allis-Chalmers, two Caterpillar, one Adams and one Austin-Western power graders was then brought in to blade the stabilized material to the same crown as the subgrade, allowing 1½ inches in thickness for bulking. The stabilized material was then ironed out by 3-wheel 10-ton steel-wheel rollers followed by a group of pneumatic-tire rollers loaded to 2 tons. The stabilized material was required to have a 25-pound California bearing ratio.

Compacted Lime-Rock Base

On the stabilized subgrade an 8-inch compacted lime-rock base was laid in two courses, using the same type of material employed in the stabilization. The initial course was spread 5½ inches thick loose, bladed to the proper crown, and then compacted by the steel-wheel rollers. The second course was spread the same depth in like manner, bladed to smoothness, then scarified to a depth of 6 inches by the teeth on the power graders, again bladed to shape, and rolled by the steel-wheel rollers followed by the pneumatic-tire rollers. For this operation the engineers gave the contractor the center and edge grades and the latter set pins every 75 feet transversely at each station to insure the proper crown. During dry weather while the work was in progress it was necessary to wet the lime rock for the best results. Water was provided by a 3,000-gallon tank truck with a hand-spray device at the back so that the truck did

(*Continued on next page*)

C. & E. M. Photo
A close-up of one of the tamping-leveling-finishers laying a 1¼-inch binder course 10 feet wide on an instrument runway at a Florida airfield.



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Hot-Mix Plant Set Up For 145 Tons an Hour

(*Continued from preceding page*)

not have to run over the area being prepared. Water was taken from a main laid as a part of the field utilities with tees set every 2,000 feet, and a 4,500-gallon transport truck brought the water to the truck which did the sprinkling.

When the lime-rock base was complete in a section not smaller than 1,600 x 250 feet wide, the contractor primed it, using his 1,100-gallon Etnyre pressure distributor to apply 0.12 gallon of RT-2 tar per square yard. By priming an area of this size on one side of the runway and then on the other it was possible to have several operations in progress along one section of the runway without interference. The prime was allowed to cure for a minimum of seven days before the binder course of hot-mix was placed.

145 Tons of Hot-Mix Per Hour

The paving contractor, Wesco Paving Co., set up a 150-ton Simplicity System asphalt plant adjacent to the runway on a long siding where it was possible to handle the aggregate cars as well as the lime-rock cars for the stabilization and base course for the grading contractor. The aggregates used for the paving were Birmingham slag and Florida Ojus lime rock. These were unloaded from the gondola cars by a Link-Belt Speeder crane with a 1¼-yard clamshell bucket to the hoppers of a duplex reciprocating feeder calibrated to deliver the proper proportions of slag and rock. A Bay City ⅞-yard crane and clamshell were kept as a standby.

The cold elevator delivered the aggregates to the primary drier 8 feet in diameter and 20 feet long, equipped with a Hauck steam vaporizing oil burner. This drier preheated the aggregates and delivered them to the "cold" elevator of the second double-shell drier, also equipped with a Hauck steam vaporizing oil burner. This drier was 8 feet in diameter and 15 feet long, and discharged the dried aggregates at the same end at which they entered and at a temperature of 350 degrees.

The double-dried aggregate was then raised by the hot elevator to the top of the plant where a gate permitted the aggregate to be run direct to the screens or to a surge tank of 200-tons capacity. The surge tank was used to store dried aggregate and was filled to within 2 feet of the top at the end of the day when the mixer had been shut down. In the morning when the plant was started the first aggregates through the driers were run to the surge tank and when that was filled they were run direct to the vibrating screens. During the day the material in the surge tank was drawn off at the bottom into the boot of the hot elevator, adding about 20 tons per hour to the aggregate run through the plant and thus increasing the capacity from 130 to 150 tons per hour. The surge tank served another important purpose. When the field laying was interrupted for any reason, the driers did not have to be shut down when the mixer was shut down, thus making it possible to maintain the greatest efficiency in the drying operation at all times.

Under normal operating conditions, the material from the hot elevator was delivered to the 42 x 144-inch Symonds double-deck vibrating screens and then to the bins above the weighing batchers over the pugmill mixer. A Vortex dust collector was operated in conjunction with a Clarage Fan Co. blower, taking the exhaust from the second drier and removing all dust from the dried aggregate. The dust was all returned to the mix as filler.

Asphalt was delivered by tank cars, three of which could be heated at a time and pumped either to the 100,000-gallon asphalt storage tank or direct to the weigh-box feeder line. A steam-operated Kinney asphalt pump was used for this work. Adjacent to the asphalt storage was a 12,500-gallon fuel-oil storage tank with a reciprocating steam pump to maintain the proper pressure on the nozzles at the driers. A 90-hp horizontal steam boiler supplied the steam for heating the tank cars, the steam-jacketed asphalt lines, to operate the Kinney pump, and to operate the steam rams on the weigh-box gate and the mixer door.

On the mixer platform, where one mixer operator took care of all operations, there were two Kron scales, one for aggregates and one for asphalt. The pugmill mixer was operated 45 seconds at 48 rpm for each 3-ton batch.

The asphalt plant was powered by four International diesel engines. A PD80 was used to drive the mixer, a UD18 drove the fan through a V-belt, another UD18 drove the double-shell drier, and a second PD80 was used to drive the single-shell drier, the cold elevator and the feeder. The vibrating screen was driven by a V-belt from a speed reducer at the top of the hot elevator.

The regular operating crew for this plant was as follows:

1 crane operator and an oiler, for the aggregates
2 men working in the aggregate cars spotting the bucket and cleaning up
1 feeder man
1 heat man for the two driers
1 mixer operator
1 fireman for the boiler
1 oiler for the entire plant
2 laborers
1 Foreman

The specifications for the binder and wearing-course aggregates in the hot-mix were as follows:

(*Concluded on page 40*)

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and a Cletrac Dealer near you who will give you complete information

NO MATTER what the work may be, you can do it faster, easier, better with Cletrac Tru-Traction.

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Off-the-Road Tire Care, Maintenance

Some Suggestions for Proper Use And Care of Tires and Tubes for Heavy-Duty Construction Units

✦ FOR the proper care of off-the-road tires, three considerations should be kept in mind, load, inflation and road condition. The first, of course, can be determined most accurately by using a load scale. If that is not available, some other method should be used to determine the exact weight of the load, keeping in mind not only the cubical capacity of the vehicle but the nature of the material to be hauled and whether it is wet or dry. It is by no means correct to assume, for instance, that a load of crushed stone will weigh as much or more than a load of earth of equal dimensions. As a matter of fact, air pockets make the crushed stone lighter than the more compact earth. The importance of proper loading cannot be over-emphasized, as the sidewalls of an overloaded tire will be subject to extreme and sharp flexing, causing failure in the fabric, separation, and blowout.

It would be difficult to choose between the damage caused by over-inflation and under-inflation. Besides the damage to the cords and possible impact breaks caused by excess air pressure, the over-inflated tire has a smaller tread-area contact with the ground, so that all the wear is in the center of the tread, leaving perfectly good but useless rubber on the outer edges. Also the narrower formation of the over-inflated tire causes the wheel to sink deeper into the soil, requiring more power consumption for pulling. Under-inflated tires, on the other hand, do not have sufficient air to support the load and the unsupported sidewalls are damaged beyond repair. Off-the-road tires are designed to work at lower pressures than highway tires, but they must be the correct low pressures, specified by the manufacturer. Heat, generated by the tires when in use, causes the original recommended pressure to "build up". Bleeding, or the reduction of this build-up inflation pressure, is harmful, and air pressure should be corrected when the tire is at the same temperature as the surrounding atmosphere.

The third consideration, proper haul-road condition, can best be assured by the establishment of a road patrol to locate and eradicate depressions, chuck holes and snags. If road-patrol equipment is not available, it is worthwhile to employ man-power to do the job, to insure as good a hauling surface as possible.

A few additional hints for the care of off-the-road tires are: use a boot only to get a little additional service from a tire which is beyond repair; be sure there is sufficient clearance for free rotation of the tire; a bent rim flange should be straightened at once, to prevent strain in the bead region of the tire; slow leaks and clogged or defective valves should be rectified at once; do not permit oil, grease or gasoline to remain in contact with the rubber. A new tire on a dual wheel should be mated with another new tire, as a difference in diameter of more than ¼ inch on sizes up to 9.00 and ½ inch in sizes over 9.00 will cause trouble. Different air pressures cannot safely compensate for unequal diameters.

Careful driving procedure will, of course, do much to preserve tire life. The practice of spinning the drive or traction wheels, or locking one drive wheel to make a sharp turn should be avoided, as it causes excessive tread wear. It is definitely inadvisable to exceed the recommended rate of speed for the load being carried as off-the-road tires are made for moderate speeds and even comparatively mild speeding will cause premature tire wear.

The foregoing material has been abstracted from "Care and Maintenance of Off-the-Road Tires", a booklet prepared by the Firestone Tire & Rubber Co., Akron, Ohio, and outlining in detail the proper procedure in the care, use and storage of tires and tubes used on heavy-duty construction equipment. A valuable feature of the book is the scraper data giving capacities, tire sizes and weights of various standard makes of equipment, as well as tabulations to aid in computing load weights and proper tire inflation. Copies of this booklet are available to readers of CONTRACTORS AND ENGINEERS MONTHLY direct from Firestone.

Bush of Aetna Retires; Is Succeeded by Fraher

The retirement of Edward W. Bush, engineer in the Fidelity and Surety Underwriting Department of the Aetna Casualty & Surety Co., Hartford, Conn., and the appointment of Thomas Fraher as his successor were announced recently. As an engineer, Mr. Bush was active in the construction of five bridges over the Connecticut River, including the present stone-arch bridge at Hartford. He joined Aetna in 1917, and for more than twenty years has been a member of the contract bond underwriting committee and was a prime mover in the formation of the Construction Division of the National Safety Council. As an authority on contract specifications, he was invited to assist in the wording of the specifications for the $50,000,000 Boulder Dam contract. Mr. Bush also served as a special consultant to the Hartford Flood Control Commission, making a study of the proposed dike-building program after the 1936 flood.

Mr. Fraher, who succeeds Mr. Bush, has served as an engineer on tunnel work in New York City and in Mexico, and on power-house construction in New York, New Jersey, and West Virginia. He joined Aetna in 1922 as a field engineer in the Casualty and Surety Agency Department, and has traveled widely throughout the country, inspecting proposed construction sites, checking specifications and work in progress. For a number of years, his headquarters were in San Francisco and his work concentrated largely in the Pacific Coast and Rocky Mountain states.

New Novo Sales Official

News has been received of the appointment of J. Dallas (Dal) Chapman as Assistant Sales Manager of the Novo Engine Co., Lansing, Mich. Mr. Chapman has been connected with the Novo company for twenty years, acquiring wide experience in all phases of manufacturing construction equipment and in dealer relations, and since 1935 has served as District Manager of the Central Zone.

S. D. Highway Group Affiliates With AGC

The Highway Construction Industry of South Dakota, Inc., has affiliated with the Associated General Contractors of America, Inc., as a chapter of the association. This increases the number of AGC state and local contractors' organizations serving those engaged in highway and heavy construction operations to forty-five. These groups, mostly state-wide in character, embrace a majority of such organizations of contractors in the United States, South Dakota having been one of the few remaining areas not represented in the AGC organization. The total of all AGC branches and chapters serving all types of general contractors is now increased to ninety.

The Highway Construction Industry of South Dakota, Inc., includes twenty highway contractors of that state. The officers are C. A. Wagner, Sioux Falls, President; Owen Mann, Rapid City, Vice President; and J. L. Materi, Rapid City, Secretary-Treasurer. Directors, in addition to the officers, are C. H. Lien, A. L. Hyde, and S. S. Roberts, Rapid City; Les Trotman, Miller; and Cecil Bartholow, Huron. The headquarters of the group is at Rapid City.

The arrangements for the affiliation of the Highway Construction Industry of South Dakota with the Associated General Contractors of America were conducted by W. P. Roscoe, President of the Montana Contractors Association.

Notes on Wood Signs And Other Substitutes

The invoking of the 35-mile-per-hour wartime speed limit brought about many attempts to convert metal signs to the new markings and also a much greater use of wood and processed-wood signs. The experience of the past two years has shown some interesting acceptances of the new materials and plans for further substitutes in the post-war years.

Pressed-wood signs in some states have been found to break too easily under the vicissitudes of traffic and the same has generally applied to plywood signs. In Indiana some 600 plywood signs with ⅜-inch Masonite backing were placed in service and found to give fair service in the larger sizes mounted on two posts.

Some maintenance engineers think that plastics will be the answer to many troubles in the post-war years, particularly for signs carrying reflecting beads which can be impressed in the face of the sign when the plastic is formed. One state today is using a plastic paint for signs and is baking it on the face of the sign with an infra-ray lamp.

Scotchlite has been used in one state to good purpose on wood signs, lasting at least two years in all kinds of weather. It has not proved as successful on metal signs in that state but is used in other states quite extensively.

Secret Weapon

Hitler and Tojo don't know it, but they have caught more hell through American construction equipment and methods than any secret weapon their evil minds can dream up. This is a Barber-Greene Dual Drum Dryer, not a rocket gun—one of the units of the B-G Army Airport Asphalt Plant. These plants built the runways that made possible the successful invasion of Sicily and Italy. They are resurfacing R.A.F. and American runways in England, building airfields and roads from Australia to the Aleutians. Just ordinary American construction equipment, tested and proved by American contractors before the war; ready to take its place in our highly mechanized military operations. Equipment so common that nobody thought to tell Tojo and Hitler about it.

BARBER-GREENE COMPANY, Aurora, Ill., U.S.A. 44-6

"3,000,000 miles obsolete", says Saturday Evening Post, of our highways and streets. What are you doing to help their rejuvenation? Engineering is needed; modern construction methods and equipment should be suggested to save tax money and improve the job. Let's have better roads for a better world!

R-GREENE

Future Rehabilitation In Dutch East Indies

Dutch Engineer-Author Expects American Equipment to Do the Job When the Enemy Is Driven Out and Reconstruction Can Start

(*Photos on page 4*)

✦ WITH the quiet but none-the-less deep-rooted determination characteristic of the Netherlands and its people, Jan van de Velde, Dutch engineer and author, stated, "I am on my way back". "Back" means a return to the Netherlands Indies, where Mr. van de Velde spent a number of years as a construction engineer in the islands of Java, Madeira and Sumatra, following his graduation from engineering school in Amsterdam. His work in the Pacific included highway and railroad construction for the government, and the development and construction of communications facilities for mining companies and plantation owners.

This construction effort was interrupted suddenly when the Japs struck at the islands of the Netherlands Indies, and Mr. van de Velde left Sourabaya, the second city of Java, the day the Japs landed there, escaping on one of the last ships to leave the only open port on the island, Tjilatjap. During the journey from Sourabaya to Tjilatjap, Mr. van de Velde reports hearing a constant bombardment of explosions, as planters and company officials blew up their refineries and other installations so that the Japs could not use them against us. The evacuees were landed in Australia, and from there Mr. van de Velde came to this country, where he has completed his course as a navigator in the Dutch Navy. He is now back in Australia, trained and ready to do his part in the defeat of Japan.

Previous Accomplishments

At the time of the Jap invasion, the islands of Java, Madeira and Sumatra had about 7,400 miles of asphalt roads, about 24,800 miles of hard-surfaced roads, and 7,500 miles of improved but not hard-surfaced roads. Mr. van de Velde pointed out that, although these figures are not impressive when compared with highway improvement in like areas in the United States, they represent a vast amount of work and investment in those islands, and were the beginning of an excellent highway system. What will be left for a second beginning will be mostly up to chance and the speed of reconquest. Mr. van de Velde has seen examples of systematic Jap destruction, and says that they have the experience and the will and, if given the time, they will obliterate even a mountain path.

Figures on railroad mileage open for traffic in the islands included about 4,600 miles, approximately 1,400 of which was in Java and Madeira. The Netherlands Indies government owned about 2,600 miles of this development, nearly 1,300 miles of which was in Java. The balance was held by the Netherlands Indies Railway Co., the Semerang Steam Tram Co., and the Deli Railway Co.

The last official Netherlands Indies report seen by Mr. van de Velde showed a total of 53,000 passenger cars, 8,600 buses, 10,000 motorcycles, and 13,000 "trucks", which included construction machines of all types, making a combined total of around 90,000 vehicles of all kinds.

Because of the topography, soil and climatic conditions of these islands, the maintenance of the highways and railroads has been a tough job. There are many bridges and, because of the heavy rains each year, known as the "west monsoon", many of these structures are

(*Concluded on page 62*)

State Builds Bridges On Overseas Highway

(*Continued from page 7*)

Penn-Dixie cement was trucked from Miami. Water was obtained from the Florida City-Key West pipe line which passed in the vicinity of each of the bridges.

All aggregates were proportioned by weight, using Fairbanks-Morse wheelbarrow scales, and mixed in a Jaeger 14-S mixer powered by a Waukesha motor. The concrete was delivered by chutes when possible, and by Jackson wheelbarrows when the distances and elevations precluded the use of chutes. On the center-pier pours the concrete was handled in bottom-dump buckets from the mixer on the creek bank, using a P & H crane on a barge in the channel. All concrete was cured by an application of Ritecure. All under-surfaces of the concrete structure, which are subject to damage from the salt spray of the waterway, are protected by five coats of water-gas tar, Grade TW-I-X, and one coat of refined tar Grade TR-I-25, applied in sequence after the preceding coat had been permitted to dry thoroughly. The application was made from falsework scaffolding as soon as the forms had been removed.

On each bent of falsework piling, 12 x 12-inch caps were set, and 6 x 6-inch stringers were used to support the sectional deck forms, which were so designed as to be interchangeable and were used repeatedly in the construction of the similar spans. For the long girder spans seven piles were driven in each bent of falsework instead of five as used for the shorter spans. Premoulded expansion joints were placed at the ends of each span.

Major Quantities

The principal items involved in this work were as follows:

Treated-timber piling*	5,300 lin. ft.
Concrete (caps and decks)	906 cu. yds.
Concrete (piers)	303 cu. yds.
Concrete (seal)	153 cu. yds.
Reinforcing steel	162,950 lbs.
Waterproofing concrete	2,050 sq. yds.
Concrete hand-rail	1,095 lin. ft.
Rock punching	176 holes
Treated structural timber**	10,065 MBM

*Includes 616 linear feet for fenders at piers
**Used for bracing and fenders

Personnel

This work was performed by the Florida State Road Department under the direction of E. C. DeGarmo, Assistant State Highway Engineer. W. E. Hankins was Project Engineer, and Floyd Lamb was Superintendent of Construction.

Danger to Children From Blasting Caps

The well-known "ounce of prevention" is particularly important in guarding children against the dangers of blasting caps. Each year numbers of children under the age of sixteen are injured, and in some instances killed, from playing with blasting caps. In 1943, despite a vigorous campaign for more care in handling caps, more boys and girls were injured than in the preceding year.

Since blasting caps are necessary in quarrying, road building, blasting stumps, boulders, and ditches, in mining and in many phases of agriculture, all of which are essential to the prosecution of the war, more blasting caps are being used. It is very important, therefore, that more care be used in handling these sources of potential injury to children, to be sure that they are not left lying around after blasting operations.

Since 1926, the Institute of Makers of Explosives has been carrying on a campaign to safeguard boys and girls from the dangers of playing with blasting caps. Warnings against allowing caps to fall into the hands of children are placed in every box of caps. In conjunction with that, the Institute has been carrying on an educational campaign through school authorities, parents, and other groups and facilities to teach children the dangers of playing with blasting caps and to prevent their doing so.

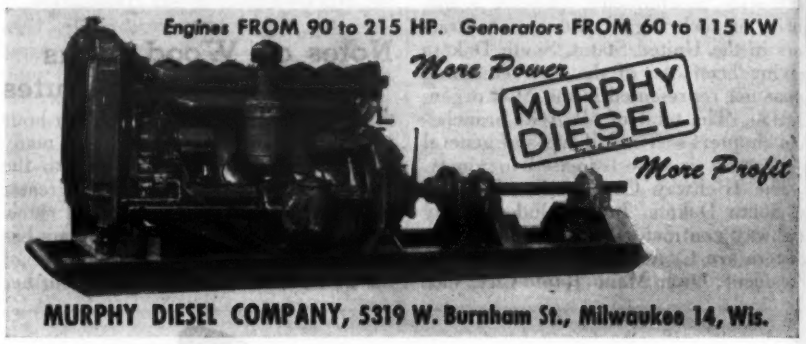
Posters and leaflets, suitable for use on bulletin boards, are available without charge on application to the Institute of Makers of Explosives, 103 Park Ave., New York 17, N. Y. It is to be hoped that the unnecessary deaths and injuries to children from carelessness with blasting caps will be greatly reduced in 1944. This can be accomplished if everyone cooperates.

Honduras-Salvador Link In Inter-American Highway

A new link in the Inter-American Highway was recently completed with the official opening of a 480-foot highway bridge across the Goascoram River separating the Central American countries of Honduras and El Salvador. This steel and concrete structure was built by a United States contractor as a cooperative venture of Honduras, El Salvador, and the U. S. Public Roads Administration.

The bridge consists of a 220-foot center span and two end spans of 130 feet each. It is 30 feet wide, with a 25-foot roadway and a 2½-foot sidewalk on either side. Built to carry safely six-wheel trucks with a load of 3 tons on the front wheels, 12 tons on the center wheels, and 12 tons on the rear wheels, tests showed the bridge's ability to carry 50-ton loads without stress.

Two-thirds of the construction cost was advanced on a loan by the Export-Import Bank in Washington, and the remainder was provided by Honduras and El Salvador, which two countries will divide the responsibility for future maintenance of the structure.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Butler Designed for Today,—
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Prepare Now...
FOR HUGE POST-WAR AIRPORT
AND HIGHWAY EXPANSION
With Butler Equipment
Engineered
BUTLER
Design
Butler bulk cement plants and batching plants built five, ten, and even twelve years ago are still working today in vital airport and highway construction — and they are working at speeds few men dreamed of a few years ago.
Then, a single 27E paver was sufficient for most jobs. Contrast this with jobs today using two 34E dual drum pavers — and sturdy, reliable Butler equipment still keeps up with the gruelling pace.
Using Butler equipment, you can meet today's problems with yesterday's plants. Be ready for postwar contracts by checking into tomorrow's already on Butler's drawing boards.
BUTLER
BIN COMPANY
WAUKESHA, WISCONSIN

The Drott Go-Devil tractor crane.

A New Tractor Crane For Yards and Shops

A new tractor crane which is hydraulically operated and steered, with traction characteristics which make it equally adaptable to indoor or outdoor work, has recently been announced by the Hi-Way Service Corp., 3841 W. Wisconsin Ave., Milwaukee 8, Wis. Known as the Drott Go-Devil tractor crane, the outfit can handle most types of lifting, loading, transporting, and unloading jobs in contractors' or state or county highway department yards and shops.

The unit has a positive hydraulic up-and-down power which enables the boom to handle loads weighing up to 2,000 pounds. Outriggers prevent the outfit from tipping under the heavier loads. The boom swings a full 360 degrees, has an extension to 90 inches and reaches to a height of 14 feet 2 inches. There is a 10½-foot turning radius, and the platform has a loading space of 20 square feet. The unit travels at speeds up to 7 miles an hour and is powered by a 4-cylinder 16-hp gasoline engine.

Power-hydraulically steered, this tractor crane may be turned under all conditions, with loaded platform, without effort on the part of the operator, according to the manufacturer. All controls are within easy reach and the operator handles all functions from his seat. A hoist worm and wheel lock arrangement is used instead of clutches and brakes for all lifting and swinging operations. Starting and stopping are said to be smooth and instant. Pusher plates and drawbars at both ends of the unit enable it to handle both pushing and towing work. Besides loading and unloading its own platform it can load and unload the trailers it pulls. Large pneumatic tires, coupled with oversize solid front tires, provide traction on soft ground or up steep inclines.

Full information on the Drott Go-Devil tractor crane may be secured direct from the manufacturer.

Repair-Parts Purchases Made Easier by New Order

Under a new order by the War Production Board, repair parts for current use on construction machinery and equipment may now be purchased by certification by the purchaser instead of through application for WPB authorization, with the exception of purchase orders of more than $1,000 for parts for shovels, cranes and draglines of less than 2½-cubic yard capacity. Such purchase orders are subject to WPB authorization.

The WPB Construction Machinery Division reports that approximately 85 per cent of all new construction equipment is needed to fill military requirements, which means that used equipment must take care of civilian needs. It has therefore been found advisable to facilitate the purchase of repair parts required to keep present equipment in operation by relaxing restrictions as much as possible.

Certification of purchase orders is in substantially the following form: "Authorized under order L-192—current use." This means that the repair parts ordered are required to replace worn out parts within 30 days after receipt and are not for stock; that the purchaser does not have other parts on hand or on order for this purpose; and that he has complied with the provisions of order L-196.

Another order affecting the purchase of repair parts for track-laying tractors has also been issued. This Supplementary General Limitation Order L-53-b removes the restrictions on the annual quantity of such repair parts which may be purchased by military agencies. Formerly, such agencies have been allowed only 40 per cent of the annual quantity, and this order remains in force for other critical items, with the exception of tractor repair parts. This new order virtually reduces the amount of repair parts available for civilian tractors.

Weld Inspection Aided By New Graphic Chart

A new and comprehensive arc welding inspection chart, designed so that operators and inspectors can tell at a glance whether welds are being properly made, has just been published by the Lincoln Electric Co., Cleveland, Ohio. This chart, which is graphically illustrated, pictures actual specimens of the various results obtained in making fillet and butt welds and describes briefly the appearance and characteristics of proper and improper weld beads, with a short description of the conditions under which each was made.

A portion of the chart is devoted to a description of the Fleet-Fillet welding technique, including a table on the procedure for single-pass horizontal and positioned fillets with Fleetweld 11, with data on electrode sizes, desired current, burn-off rates, and arc speed.

Copies of this chart, which is printed in two colors on a heavy grade of stock, 23 x 35 inches, are available without charge to engineers, inspectors, operators and others concerned with welding. Just direct your requests to Lincoln.

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Public and Private Post-War Financing

Self-Liquidating Projects; Taxes Needed Outside Real Estate for Public Works; Ample Private Funds

By ERNEST M. FISHER, Deputy Manager, American Bankers Association

CONSTRUCTION activities, from the point of view of financing, fall into two major categories: those which are financed with public funds, and initiated by and carried out for public authorities; and those that are privately financed, and initiated and carried out for private parties. To the first category we usually apply the term "public works", and to the second, "private construction".

Financing Public Works

The financing of public works is a task of the governmental agencies, Federal, state and local. The procedures employed in the past in financing public works are familiar. On the whole, they have involved borrowings secured by the taxing power of the government unit involved. The projects themselves have provided facilities which, for the most part, have been of such a public character that it was either not feasible or not wise to make the use of the facilities contingent upon the payment of a fee. The debt service, therefore, had to be met out of the general revenues of the governmental unit.

But recently some notable exceptions have appeared, and the facilities created by public authority have been subjected to a use tax out of which the debt service has been met. These projects have come to be known as "self-liquidating" public works.

The principle involved is basic. Its extension after the war could probably be very wide. The success of such pre-war projects as the Pennsylvania Turnpike, the bridges in the San Francisco area, and numerous others would seem to justify careful exploration on the part of government of the public needs for the construction of facilities which might be financed in this manner. Many more projects than one might think will be found to qualify. Turnpikes, bridges, parking facilities, airports, hospitals are some of the types of projects which suggest themselves as needed in post-war years and are adaptable to the application of the use fee to make the project self-liquidating.

But there are other types of public works, the need for which will be acute at the end of the war, to which this requirement of a use fee would not be applicable. These will have to be financed out of the general revenues of the government unit involved.

So far as the Federal government is concerned, one probably either adopts the attitude of those who say that the amount of the internal debt is of no significance since "we owe it to each other", or he takes the position that a debt of the government is a debt to individual citizens that must be serviced and the servicing of which may rest as a brake on economic progress.

Local Finances Generally Good

Fortunately, the financial condition of local and state governments has been greatly strengthened in the past decade, and is likely to continue to be strengthened, with some notable and regrettable exceptions, until the end of the war. It is not unlikely, therefore, that many local and state governments can embark with safety and with assurance upon a program of construction of the most needed public facilities financed by available funds or by borrowings.

But so long as local revenues are so completely dependent upon taxes levied on real estate, a great deal of caution must be exercised in making further borrowings, the debt service on which must be met from these taxes. It may be that necessary public facilities whose use is to be free to the public should be produced, in most instances, only if their debt service is provided for by the levying of some new sort of taxes more appropriately adjusted to the benefits which flow from the project than the real-estate tax levy is. It seems that the metropolis has long since outgrown the fiscal arrangements by which it is served, and that the chances for the metropolis' adapting itself to the fiscal machinery are much less than that the machinery will have to adapt itself to the metropolis. It is with this conviction that the suggestion is made that additional types of revenue be created to serve the local debt resulting from post-war public construction.

Financing Private Projects

Since time immemorial, private construction has been financed through the use of mortgages. Funds for the financing of private construction, then, must be of two types: those which represent indebtedness, and those which represent equity.

For the financing of mortgage indebtedness, ample funds will be available in the post-war period. With bank deposits rapidly approaching the $100,000,000,000 mark, of which nearly one-third are time deposits; with over $20,000,000,000 of money in circulation; with life insurance company reserves at unprecedented levels; and with building and savings and loan associations embarrassed with a surplus of investable funds, to say nothing of the funds in the hands of individuals which will be seeking an investment outlet, there ought to be no difficulty in the post-war period in securing all the mortgage credit for which any reasonable demand can be foreseen.

There are certain limitations, however, upon the investment of these funds in

(Concluded on page 71)

Unemployment

It may not be amiss to point out that private funds are never invested in either equities or indebtedness for the sake of curing or preventing unemployment. The sole test is soundness of the proposed project. It is confusing to hear it advanced as an argument for a larger volume of private construction that this is necessary to prevent unemployment. The argument proceeds from a mistaken assumption. It presupposes a bankrupt or decaying economy in which in desperation employment must be created for its own sake.

WHEN THE SIGNAL COMES for invasion, the United States Armed Forces, according to present estimates, will have approximately 11,000,000 men ready for combat.

These millions of Americans, combined with the forces of the United Nations will represent the largest army in the world of combat soldiers and one that will assure Victory at the time of invasion.

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A new all-weather ac welder.

New All-Weather-Type AC Welding Machine

Wilson Bumblebee alternating-current welders are now available in all-weather models of 300 and 500-ampere capacities. These units are similar to the standard Wilson Bumblebee welders, except that they have special moisture-proof insulation throughout, and all parts are protected by a heavy coating of moisture-proof paint. The outer case is finished in a durable weather-resisting enamel, and has gaskets and louvers designed to prevent the entrance of rain.

In addition, this new Wilson Bumblebee is equipped with a low-voltage contactor which automatically holds the open-circuit voltage at approximately 40 volts. When the operator strikes the arc, the low-voltage contactor closes instantly and the transformer's performance thereafter is that of machines not similarly equipped. When the arc is extinguished, this device immediately reduces the voltage back to 40 volts.

In all other respects, these all-weather models have the same features as the standard Wilson Bumblebee, including wide current range, high electrical efficiency, improved power factor, and easy maintenance. All-weather Bumblebee ac welders are made by the Wilson Welder & Metals Co., Inc., 60 East 42nd St., New York City, and are distributed by Air Reduction Sales Co., located at the same address, from whom complete information on these units may be obtained.

Concrete Curing Mfrs. Form New Association

The manufacturers of membrane compounds for curing concrete have organized for the purpose of unification and betterment of the concrete curing industry, the primary objectives of the organization being the clarification of testing methods, adoption of standard specifications, and the establishment of uniform application methods. As a result of a meeting held in Chicago, February 29, concurrent with the American Concrete Institute meeting, a temporary organization was formed, with Gloster P. Hevenor, Johnson-March Corp., New York City, as Chairman, and Clark Moots, Battenfeld Grease & Oil Corp., Kansas City, as Secretary. The executive committee consists of Mr. Hevenor; George W. Whitesides, Solvents & Plastics Co. of Louisville; R. W. Madison, Truscon Laboratories of Detroit; and A. F. Penny, G. F. Sterne & Sons, Ltd., Brantford, Ont., Canada.

The member companies, producing over 90 per cent of all the membrane curing compound used in the United States and Canada, are: Johnson-March Corp., New York City; Solvents & Plastics Co., St. Louis, Mo.; Truscon Laboratories, Detroit, Mich.; Master Builders, Cleveland, Ohio; G. F. Sterne & Sons, Ltd., Brantford, Ont.; Battenfeld Grease & Oil Corp, Kansas City, Mo.; Federal Waterproofing Co., Indianapolis, Ind.; Industrial Products Mfg. Co., Kansas City, Mo.; Hunt Process Co., Los Angeles, Calif.; Wall Products Co., Newark, N. J.; and L. Sonneborn Sons, New York City.

The curing association presented a communication to Committee 617 of the American Concrete Institute, suggesting the inclusion of membraneous curing as an alternate method in the specification now under consideration and recommended that the standard test for evaluating membraneous cures be A.S.T.M. Standard C-156-40T, with certain minor modifications, and that the specification be standardized with that recommended by the Highway Research Board.

It was pointed out that membraneous curing has been used on practically all of the important defense projects throughout the United States, Canada and the Island bases, is now generally accepted as a standard for the concrete construction industry and that, by cooperation of the manufacturers with all governmental rulings, this was generally accomplished without the use of critical materials.

Engineers' Dictionary In English and Spanish

A timely help to the Good Neighbor policy appears in the form of a Spanish-English and English-Spanish Dictionary for engineers, compiled by Louis A. Robb, Member, American Society of Civil Engineers, and based on twenty-five years of practical engineering experience in Latin America. A feature of the book is the fact that it gives the engineering and construction terms used in the various localities of South America, indicating by abbreviations the words which are peculiar to certain countries or states. As is pointed out in the preface, engineering terminology in Spanish America differs from that of Spain, and there is even considerable variation in the use of words among the eighteen Spanish-speaking republics.

This Engineers' Dictionary, which is of convenient size and has a semi-flexible binding, is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Price: $6.00.

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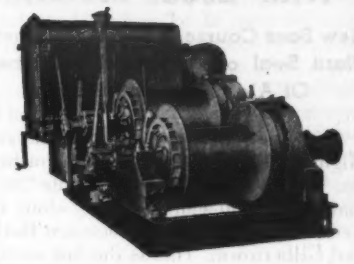

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Construction Economy With Local Materials

New Base Course, Surface Treatment, Plant Seal on Improved Alignment Of Ala. 26 South of Butler

✦ FOR the past two years the Alabama Highway Department has been pushing the improvement of State Route 26, a main north-and-south highway along the western edge of the state between Butler and Gilbertown. This is the last section of unpaved road on the Muscle Shoals to Mobile Highway, talked of so much in pre-war days. The present major improvements in grade, alignment, and surface have a definite effect on both war and post-war traffic.

The changes in line have eliminated many obsolete bridges that were frequently endangered by flash floods on small streams. Improvements in grade and the elimination of many sharp curves, as well as the widening of many sections to the standard 20-foot roadway, have been a great help to the increasing war traffic over this route. With this major north-south artery in good condition for traffic, post-war plans can be made to improve other parallel roads without depriving essential traffic of a good route to use during the improvement of other highways.

This 17-mile project, No. S-256E, was preceded by intensive soil surveys and material prospecting for suitable base and surface materials for its entire length and as much as 3 miles back from the road on either side. This resulted in the economical production of base-course materials by state equipment with no hauls greater than 4½ miles.

The right-of-way for the full 17 miles, with a few minor exceptions, is 120 feet. The roadway width is uniformly 30 feet with a paved surface 20 feet wide, having a crown of ⅓ inch per foot. The shoulders are 5 feet wide with a slope of ½ inch per foot. The slope on fills over 6 feet is 1½ to 1, while under that height they are flattened to as little as 4 to 1. The backslopes, in one place as steep as 1½ to 1 on a bank of fuller's earth and sand-clay, run as low as 4 to 1 and all figures in between, depending on the depth of the cut and the character of the soil.

The improvement of the base course and surfacing cost less than $5,500 per mile. The surface is varied, depending on the most economical material available in the different sections. A single bituminous surface treatment with a plant-mix seal has been used most of the way. A double bituminous surface treatment with special aggregate was used as an experiment for 600 feet. The surface aggregate for 4.5 miles at the north end is slag from Birmingham, Ala., and the balance is gravel.

Some idea of the cost of this construction, exclusive of grading, is found in the following figures which include all costs of plant, and both free and prison labor employed: base, 63 cents per cubic yard in place or 21 cents per square yard; single surface treatment, 14 cents per square yard; and plant-mix seal, 12 cents per square yard; or 47 cents per square yard complete.

Construction Contracts Exempt from Renegotiation

Title VII of the Revenue Act of 1943, recently enacted over the President's veto, constitutes a complete rewriting of the law pertaining to the renegotiation of war contracts and has several provisions applying specifically to construction contracts, as is pointed out in a recent bulletin from the American Road Builders' Association.

As rewritten, the renegotiation statute wholly exempts any construction contract awarded as a result of competitive bidding for the construction of any building, structure, improvement or facility, and likewise exempts any subcontract directly or indirectly under a construction contract. Another change is that any contractor whose government business aggregates less than $500,000 for the fiscal year in question is exempt from renegotiation. The previous exemption was $100,000.

The 1943 Revenue Act also strengthens the statutory direction concerning exclusions and deductions by requiring allowance of all costs estimated to be allowable as deductions and exclusions under Chapters 1 and 2(e) of the Internal Revenue Code (excluding taxes measured by income), and directs that renegotiation must be on an overall basis, including the aggregate of all amounts received or accrued from renegotiable business during the fiscal year involved.

Equally significant are the amendments which protect government contractors and subcontractors against arbitrary or capricious treatment by Price Adjustment Boards by assuring contractors of the express right to court review of past as well as future determinations of such Boards in those cases where voluntary agreement was not reached. Such petition should be made within 90 days after the War Contracts Price Adjustment Board finally determines the amount of excessive profits.

Army-Navy "E" Awards

An Army-Navy "E" Award for excellence in production was recently given to the Wilkes-Barre, Pa., Plant of the Hazard Wire Rope and American Cable Divisions of American Chain & Cable Co., Inc.

The Mansfield, Ohio, Plant of the Stran-Steel Division, Great Lakes Steel Corp., also recently received the "E" Award for excellence in production of Quonset huts and all-purpose utility buildings.

War Inspire

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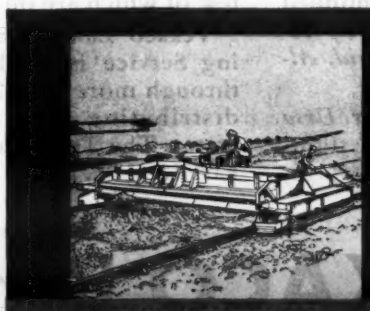
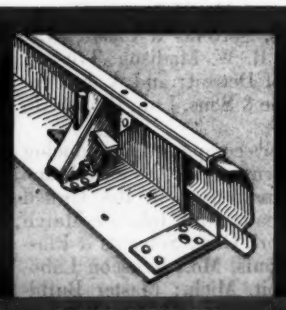
BACK THE ATTACK WITH WAR BONDS AND STAMPS


PAVING SPREADERS FOR AIRPORTS AND ROADS

FINISHING MACHINES FOR AIRPORTS AND ROADS


PAVING FORMS FOR AIRPORTS AND ROADS

P & H Announces New Repair-Parts Division

Because of the growing demand for repair and replacement parts as a result of wartime burdens on equipment, and to facilitate service to its customers, a separate division for handling such business on all P & H products was recently established by the Harnischfeger Corp., Milwaukee, Wis. The new Repair Sales Division is being managed by J. D. Glatz, recently returned from Washington after two years with the WPB as Chief of the Crane and Hoist Section in the Tools Division. Prior to that, he was P & H representative in the Chicago area.

Operations of the Repair Sales Division under Mr. Glatz are of wide scope because of the range of P & H products, including gasoline, diesel and electric-powered shovels, cranes, draglines, electric overhead traveling cranes, hoists, ac and dc welders, and welding electrodes and positioners.

Commercial Laboratories Directory Just Published

To provide information on the scope of activities of independent laboratories and the advantages to be derived from the utilization of their services in the solution of scientific, engineering, testing and inspection problems, the American Council of Commercial Laboratories has just published a Directory of its members and the services which each offers. The information on each laboratory includes its staff, the types of services it can provide, its special equipment, and other pertinent facts. In the back is an extensive list of materials, with a key indicating the laboratories which could be called upon for analyses, inspection, research and testing for each.

Copies of this Directory may be secured without charge from the Executive Secretary, American Council of Commercial Laboratories, 63 Wall St., New York 5, N. Y. Just mention this item.

New York State Provides Money for Post-War Roads

The 1944 session of the New York Legislature earmarked $140,000,000 for general post-war construction, to include roads and bridges, or to meet any general decline in state revenues in the post-war period. This puts into effect a proposal of Governor Dewey, who stated: "The spectre of continually threatening deficits robbed our highways of proper maintenance and needed expansion . . . The highways are being taken care of on the surface but many of them are wholly inadequate to meet the demands of modern traffic."

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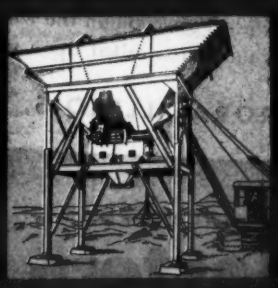
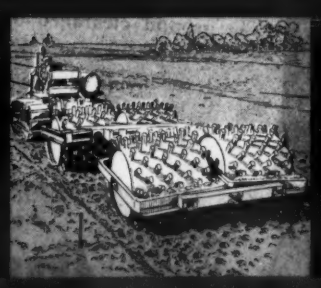

AGGREGATE BATCHING PLANTS

CLAMSHELL BUCKETS


SHEEPSFOOT TAMPING ROLLERS

CONCRETE BUCKETS

Right Extinguishers To Fight Your Fires

Effective first-aid fire fighting, whether it be in an industrial plant, a garage or warehouse, or on a construction job, requires the use of a suitable extinguisher on each different kind of fire. There are three classes of fires, each determined by what is burning, and for each class there is an appropriate and proper type of extinguisher.

Fires in ordinary combustible materials, such as wood, paper, textiles, rubbish, etc., are known as Class A fires. They are best put out with water, which has a cooling and quenching effect. Extinguishers which contain water or chemicals and water are the soda-acid, foam, pump-tank, gas-cartridge and loaded stream types. Vaporizing-liquid and carbon-dioxide extinguishers also are effective for controlling small Class A fires, if the fires are not deep-seated and if there are no strong air currents to dissipate the vapor or gas. In general, these types would be ruled out on construction work.

Fire in flammable liquids, grease, etc., are known as Class B fires. Here a blanketing effect is essential, to cut off the oxygen supply. Suitable extinguishers are foam, vaporizing-liquid, carbon-dioxide, and loaded stream.

Fires in electrical equipment, Class C fires, require the use of extinguishers which will neither damage equipment nor convey an electrical charge along the hose stream to the operator. Vaporizing-liquid and carbon-dioxide extinguishers are suitable for use on fires of this type. However, in some cases, fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water is necessary. In such cases, the equipment should be made electrically dead before water or water solution is applied. This case could seldom occur on construction projects except in large motors driving compressors or large pumps for air or hydraulic power.

The Underwriters' Laboratories label on every approved fire extinguisher indicates the class or classes of fire for which that extinguisher is considered suitable and the number of such extinguishers considered necessary to comprise one unit of protection. Thus, a 2½-gallon foam extinguisher is designated "A-1; B-1", meaning that it is approved for use on both Class A and Class B fires, and that one such extinguisher is required to make one unit of protection. These units of protection are standards that have been established by Underwriters' Laboratories for convenience in measuring relative fire protection afforded by different kinds and sizes of portable fire-extinguishing appliances.

The number of units of protection required in any given location depends upon the relative severity of the incipient fire to be anticipated. The National Fire Protection Association recognizes three general classes of occupancies: light hazard, ordinary combustible, and extra hazardous. A guide for determining the number of units of protection required for each class of occupancy has been worked out. For instance, a place where fires of average intensity may be anticipated should have units so located that a person will not have to travel more than 50 feet from any point to reach the nearest unit, but at least one unit will be required for each 2,500 square feet of floor area.

The inspection department having jurisdiction usually will determine the degree of hazard of any given occupancy. Further information is contained in a pamphlet entitled "First Aid Fire Appliances", published by the National Board of Fire Underwriters, 85 John St., New York, N.Y. Copies of this pamphlet may be secured by readers of CONTRACTORS AND ENGINEERS MONTHLY, without charge, by writing direct to the Board of Underwriters and mentioning this publication.

For Better Roads
TOMORROW
***Plan* TODAY!**

KINNEY
BITUMINOUS
DISTRIBUTORS

Each day brings us closer to Victory, and nearer to the time when Kinney Bituminous Distributors will again be available with all their well known features of design—and with new improvements, too. Plan now for post-war road building in which Kinney Distributors will play an efficient and important part.

KINNEY
MANUFACTURING COMPANY
3531 Washington St., Boston 30, Mass.
Branch Offices
New York Chicago Los Angeles
Philadelphia San Francisco
We also manufacture Liquid and Vacuum Pumps, Strainers, Clutches and Cut-off Couplings.

Water Ballast Saves Money . . .
by making it possible for the roller to handle a wider variety of jobs. A-W variable weight Tandem Rollers are made in two sizes . . . 5 to 8 ton and 8 to 10½ ton.

Does a LOT of rolling jobs a LOT faster

HERE'S a roller you can count on for fast, economical performance . . . season after season. Its many refinements in design make this smooth performing A-W Tandem a preferred machine for accurate work.

With an A-W Tandem your operator can work closer to curbs because visibility is better, there is less frame over-hang, and more ground clearance under side plates. More convenient controls, with reversing clutch lever mounted on steering column, combine with effortless hydraulic steer to save time and increase efficiency. It changes direction—forward or backward—with that vibration-less smoothness that means a better job and less wear and tear on the machine itself. A lower center of gravity prevents side sway.

A-W variable weight Tandem Rollers are built in 5 to 8 ton and 8 to 10½ ton sizes. Write for complete information on advantages they'll give you on the wide variety of jobs a tandem is called upon to handle.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U. S. A.

BUY MORE WAR BONDS

Long Wood Trusses Fabricated In Jig

Bored, Grooved, Assembled In Sections at Central Yard; Erected by Efficient Use Of Workmen and Machines

✦ AT a southern Army Air Depot there developed, early in 1943, the need for new warehouses for enclosed storage. The job of fabricating and erecting 176 wooden roof trusses, each 202 feet long, for these structures, was sublet to a contractor who finished the work in short order by methods which permitted the use of workmen not experienced with this type of construction.

The almost 900,000 board feet of lumber required for the trusses was shipped in from various mills by rail and was unloaded on the reservation at a location convenient to the contractor's yard. Sorted by sizes and commercial lengths during the unloading process, the lumber was hauled to the pattern saws by two job-built rubber-tired trailers and a Fordson tractor, one trailer being moved while the second was being loaded.

The pattern saws were three DeWalt units operated by electric motors fed from the conveniently located power lines of the base. Each piece of lumber was cut to its exact finished length, squared or beveled as required by pattern, painted with an identifying number, and stored by lengths and sizes.

The Fabricating Jigs

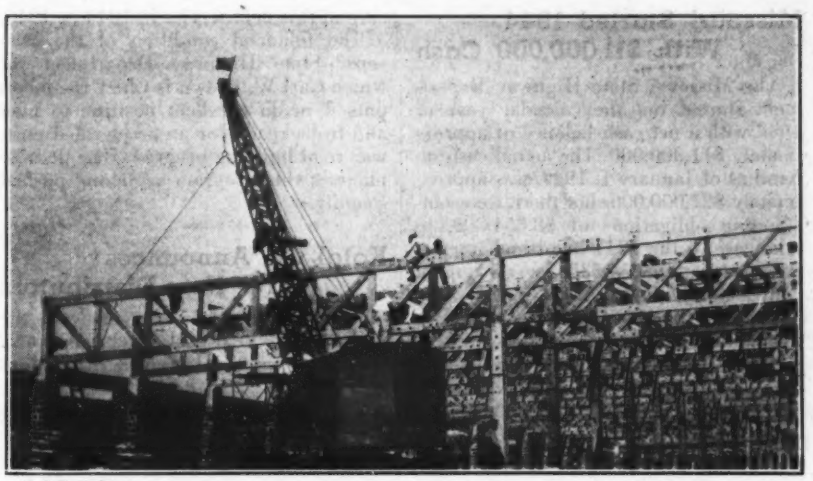
Two flat level platforms were constructed of 2-inch lumber on stringers and leveling blocks. Each platform was 210 feet long and 10 feet wide. The exact position of each member of the trusses was marked on the platforms and 2 x 4 stubs 16 inches high were set in position to fix the edges of each truss member. The same identifying number which had been painted on the component parts when they were cut to length was painted in each space outlined by the stubs. Allowance for the 25-inch camber of the trusses was made in placing the stubs which marked the positions of the top and bottom chords. With each member so outlined, it was a simple matter for the most inexperienced laborer to place the individual truss members in their proper position.

The trusses are identical, designed as continuous frames with three interior support columns which were made an integral part of the truss framing but were detached from the truss temporarily to facilitate hauling. Economy in the use of the selected No. 2 dense southern-pine lumber was effected in the design which provided for the use of 2 and 3-inch lumber in widths of 6 to 12 inches and of short lengths.

As the previously sawed lumber was placed in position in the jigs, all bolt holes were bored and the grooves for the Teco ring connectors were cut. This was done by workmen with seven Black & Decker heavy-duty electric drills and three Ingersoll-Rand Multi-Vane reversible air drills. Power for the electric drills was obtained from electric lines run on poles adjacent to the fabricating platforms, and air for the pneumatic tools was furnished by an Ingersoll-Rand 9 x 8 compressor driven by a General Electric 40-hp motor. Air was stored in a metal cylinder 3 feet in diameter and 10 feet long at a pressure of 105 pounds and delivered to the point of use through a 2-inch air line laid parallel to the platforms, with a 1-inch outlet every 30 feet.

Although the tools were switched from point to point as needed, the regular procedure was to use two electric drills for boring bolt holes, two air drills and three electric drills for cutting grooves to accommodate the Teco ring connectors, and one pneumatic and two electric tools for tightening bolts and nuts.

(*Concluded on page* 53)



C. & E. M. Photo

A Northwest crawler crane erected the prefabricated 202-foot wooden roof trusses for new enclosed storage warehouses at a southern Army Air Depot.

USE RIGHT BUCKET FOR THE JOB

Hayward makes all four — clamshell, dragline, electric motor, orange peel. A Hayward recommendation is unprejudiced.

HAYCO

THE HAYWARD CO., 32-36 Dey St., New York

Hayward Buckets

Oils, Asphalts and Tars

QUICKEST HEATING

Speediest Transfer to Distributor

BROS CIRCULATOR

A CIRCULATING TANK CAR HEATER

Designed for maximum efficiency, low operating costs and long life

The Bros Circulator starts asphalts and tars at 20° above their solidifying point. It raises the temperature of a car 50° F. per hour after circulation is started—and transfers the heated materials to the distributor at the rate of 325 gallons per minute. Steam is seldom, if ever required, as average SC7 can be started at 60° F. Oil is taken in at the coldest spot on the circulator and discharged at the hottest spot so there's no danger of scorching, burning or cracking the asphalt. That's its operating record.

Its design assures maximum economy and efficiency. The Oil Burner is non-clogging and air-atomizing with positive flame control. There is no carbon to remove from the heating element—a feature that saves time and money—and the heating element contains no dangerous gas pockets to cause explosion.

The burner of the pre-heater is removable and connected by long rubber tubing to the fuel oil pump. It can be used as a torch for application of direct flame heat to car valve section or to hose, to speed flow of oil.

A silent chain drive, running in oil, operates pump unit, providing noiseless, trouble-free performance. Four pumping speeds are provided for maximum efficiency. Shear pin protection for pump and drive shaft. Ford Motor Power Unit. No draining between jobs.

With its low center of gravity, the Bros Circulator permits Semi-Trailer mounting so essential for fast, safe driving. Complete details will be sent on request.

ROAD MACHINERY DIVISION

WM. BROS BOILER & MFG. CO.

Minneapolis 14, Minnesota

BROS CIRCULATOR

A CIRCULATING TANK CAR HEATER

Missouri Started 1944 With $11,000,000 Cash

The Missouri State Highway Department started out the calendar year of 1944 with a net cash balance of approximately $11,300,000. The actual cash on hand as of January 1, 1944, was approximately $21,000,000, but there were outstanding obligations of $8,854,800, to take care of the 1944 bond and interest payments and $854,538 for an unpaid contract obligation.

Having the 1944 bond obligations available in cash has eliminated any possibility of a direct property tax to take care of this debt service in 1944 or 1945.

The financial condition of the Missouri State Highway Department, of which Carl W. Brown is Chief Engineer, puts it in an excellent position to plan and to be ready for an accelerated postwar road building program. The definite plans of this program are being pushed steadily.

Kotal Co. Announces Five New Distributors

Announcement has been made by the Kotal Co. of New York City, maker of a chemical compound used in bituminous pavements, of the appointment of the Smith Booth Usher Co. of Los Angeles as its western representative, covering California, Nevada and Arizona. Other recent Kotal dealer appointments are the Carter-Waters Corp. of Kansas City as distributor in Missouri, Kansas, Nebraska, Oklahoma and southern Iowa; the Wasatch Oil Refining Co. of Salt Lake City as distributor in the state of Utah; the Lake Asphalt & Petroleum Corp. for Minnesota, northern Iowa, and North and South Dakota; and Drummond & Co., Inc., an affiliate of the Arundel Corp. of Baltimore, for the District of Columbia, Virginia and Maryland.

Atlas Powder Veteran Dies on Pacific Coas

Albert E. Deegan, special field repre-sentative of the Atlas Powder Co. in th West for twenty years, died in Los An-geles recently after a short illness. We known in the explosives and construc-tion industries because of his work o many construction, tunnel and quarry jobs, Mr. Deegan had been associate with Atlas Powder Co. since 1924. H was considered an outstanding authorit on the proper application of explosive particularly in the field of tunnel or co-yote blasting.

AMERICA IS *Built with Aggregate!*

Cedarapids — Built by IOWA

THE IOWA LINE
of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS — STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS — TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

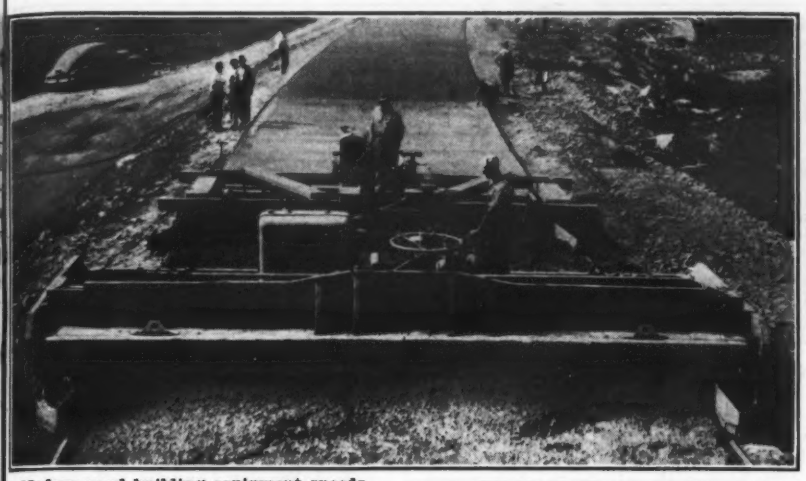
The Skylines of America—

Virtually stone by stone, they have risen out of a wilderness — the most practical demonstration of what free enterprise can do!

Led by Iowa, aggregate producing equipment has come a long way! The cost of building the skylines of the future, the highways of the future, the skyways of the future, is going to be a lot less for America's coming generations because of Iowa "Cedarapids" equipment.

When figuring your future contracts, plan to check into "Cedarapids" advantages — they are different — they mean lower cost aggregate, a bidding advantage to you and more profit. Come to headquarters for aggregate producing and crushing equipment.

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA



Modern road-building equipment speeds emergency reconstruction of the vital London-to-Ingersoll link of Canada's chief east-west motor route, the Queen Elizabeth Highway, connecting Windsor and Montreal. The equipment included the Blaw-Knox concrete spreader and the finishing machine shown on a super-elevated curve on the two-lane highway. Since the old foundation was pronounced sound, the new pavement was laid right over the old.

PRA Accomplishments In Fiscal Year 1943

During the fiscal year ending June 30, 1943, the Public Roads Administration completed 8,445 miles of highway of all classes, as compared with 10,178 in the preceding year, and 12,936 in the fiscal year 1941. Highways completed consist of 4,148 miles on the Federal-Aid system, 1,056 miles on secondary Federal-Aid roads, 106 miles in connection with elimination of railroad grade crossings, 2,836 miles of access roads to war industries and military and naval establishments, 168 miles of national forest highways, and 131 miles of miscellaneous construction. One hundred and eighty-seven highway-railroad grade crossings were eliminated, 34 obsolete structures were reconstructed, and 196 crossings were protected by signals or other devices. The total cost of all completed work was $274,801,799, of which the Federal government paid $196,600,272, or 72 per cent.

Approvals of new projects fell to the lowest level in many years, amounting to 5,861 miles. This mileage was composed of 4,753 of access roads to war industries and military and naval establishments, and the remaining 1,108 miles, although financed with Federal-Aid and miscellaneous funds, were all certified by war agencies as essential to the conduct of the war.

At the beginning of the fiscal year, the $150,000,000 authorized for access roads by the Act of November 19, 1941, was increased to $260,000,000. No other funds became available during the year but remaining portions of Federal-Aid funds were applied to war projects to the extent possible under limitations of law.

At the end of the year, 6,154 miles of highway and 144 grade-crossing eliminations were actively under construction or approved for construction, at a total cost of $306,423,945, of which the Federal government was to pay $249,969,759. At the same time 1,559 miles of highway and 56 grade-crossing eliminations were recorded as in the same status but further work on these projects had been indefinitely deferred by direction of the War Production Board by reason of conditions arising from the war.

Work on the Alaska Highway from Dawson Creek, British Columbia, to Fairbanks, Alaska, a distance of 1,600 miles, was aided by the PRA. Field offices were established at various places along the route and during the summer of 1942 a force of 500 engineers and engineering aids supervised nearly 7,000 men employed by the contractors. The Public Roads Administration also continued its assistance to the republics of Central America in the construction of the Inter-American Highway. Engineering advice and assistance was also furnished on a wide variety of road work in Latin America in Honduras, Nicaragua, El Salvador, Costa Rica and Ecuador.

New Book on Stresses In Framed Structures

A new book to simplify and speed up work on structural design, and explaining modern methods for the determination of stresses in beams, roof trusses, bridge trusses, lateral trusses, and rectangular tower structures, is announced by the McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. This second edition of "Stresses in Framed Structures", revised by R. R. Zipprodt and George C. Ernst, includes practical materials on methods for determining moments and shears in beams and trusses due to fixed and moving loads, for determining stresses in all modern types of bridge trusses for simple spans, a complete treatment of the deflection of trusses, stresses in redundant members and secondary trusses, complete analyses of statistically indeterminate frames by the slope deflection method, and a number of illustrative worked-out problems.

Serving either as a means of reviewing fundamentals of stresses or in looking up solutions applicable to specific problems and structures, this book should prove a help to engineers now engaged in planning and designing post-war structures and bringing them to the contract-letting stage. Copies of "Stresses in Framed Structures" may be secured direct from the publisher or from this magazine. Price: $5.00.

SAND'S Aluminum Line & Surface LEVEL

Endorsed and Adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.

SAND'S LEVEL & TOOL CO.
8531 Gratiot Ave. Detroit 13, Mich.

M-4 MILITARY TRACTOR

Cooperating with the Army Ordnance Department, Allis-Chalmers Tractor Division designed and is building M-4 Military Tractors.

"FUSTEST WITH THE MOSTEST"

Carrying on in the legendary tradition of Lt. Gen. Nathan Bedford Forrest, Allied military commanders today are "gittin' thar fustest" with their big guns to smash enemy resistance.

New, track-laying M-4 Military Tractors enable our Field, Coast and Antiaircraft Artillery to accelerate the sizzling pace of mechanized warfare. Where in previous wars men and mules tugged and strained to pull heavy guns into position . . . now these powerful "battle-wagons" have taken over. They look like giant steel bugs, race with the speed of trucks . . . have the pulling power of a track-type tractor — haul the heaviest artillery over shell holes and ditches . . . through loose sand or muck and mud . . . up mountainous hillsides.

This new weapon of movement not only pulls the artillery but carries the gun crew of eleven men and initial rounds of ammunition, is equipped with a machine gun, ammunition compartments, shell hoist and towing winch.

Built for combat service, the M-4 is a development of the coordinated effort of the Army Ordnance Department and the Allis-Chalmers Tractor Division organization. It is a tool we are mighty proud to place in the hands of our armed forces . . . for it helps give United Nations' fighting men the important advantage of getting there *first* with superior fire power.

ARMY E NAVY

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE, U. S. A.

New Levee Protects Vital War Industry

Tulsa, Okla., Flood-Control Project Includes Concrete Floodwall on Concrete Sheet Piling; Seepage Wells

By FRANK B. SARLES,
Field Editor

(*Photos on pages* 1 *and* 84)

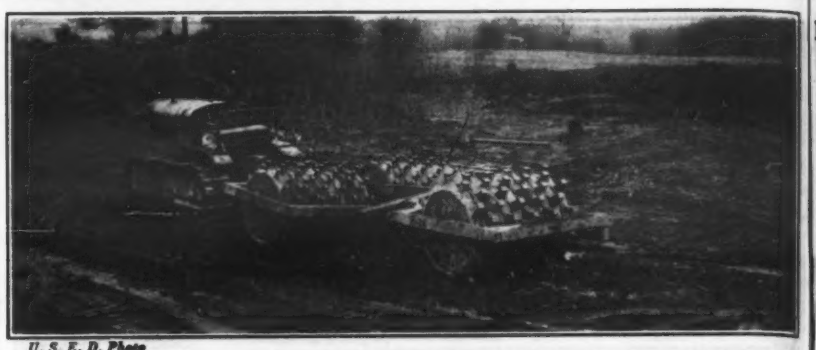
✦ CONSTRUCTION of the Tulsa-West Tulsa, Okla., levee as protection to two war industries was instituted during 1943 when the U. S. Engineer Department awarded a contract to Ottinger Brothers of Oklahoma City, Okla., for work near the town of Sand Springs, Okla., on the Arkansas River. The existence of two industries in Sand Springs, a plant of the Sheffield Steel Co., and a Sinclair oil refinery, as well as a number of smaller war plants, necessitated this construction at the present time.

The initial contract for the proposed improvement was for the construction of approximately 5 miles of loop levee around the town of Sand Springs and west of Blackboy Creek. Another contract for the construction of the floodway structure at the creek and the pump stations is to be awarded in the near future.

Approximately 65 per cent of the work was enlargement of existing levee with a grade raise of 6 feet, while 35 per cent was new levee. The alignment was adjusted to provide protection for two producing oil wells located so close to the old levee that they would have been obliterated if the new construction had followed the original center line. On one short portion of the improvement, space limitations made necessary the construction of a concrete floodwall on concrete sheet piling instead of the conventional earth levee, and the work was further complicated by the existence of a 36-inch water-supply line of wood staves, as well as a 96-inch concrete storm sewer from the town and a 24-inch cast-iron line draining acid water away from the refinery. Construction of 400 seepage wells and an extensive collection system for seepage water was necessitated by the porous nature of the ground on which the levee was constructed.

Earth-Moving Operations

On the western portion of this job, borrow pits were available adjacent to the proposed construction and it was necessary only to strip and stockpile the topsoil, which was later spread as a 6-inch blanket over the completed levee, in order to obtain the necessary embankment material within very moderate hauls. East of the Tulsa-Enid highway, U. S. 64, however, the borrow situation was quite different. Due to abutting improvements, it was impossible to obtain levee-side borrow, making it necessary to haul embankment dirt from long distances. Hauls ranged from 2,600 to 4,300 feet but by the use of an ample tractor-scraper outfit, both the short and long hauls were completed. This dirt-moving outfit consisted of eight LeTourneau, four Adams, and four Gar Wood scrapers, pulled by six International, three Allis-Chalmers, and six Caterpillar tractors, which were switched from scraper to scraper as needs and breakdowns indicated. Two Allis-Chalmers tractors served as pushers, an International tractor pulled two 42-inch x 5-foot tamping rollers and another operated with a Bucyrus-Erie bulldozer. All equipment was lubricated on the job by a Model 5163 HG Wayne lubricating outfit mounted on pipe skids and covered with tarpaulins on a pipe frame. This was dragged about the job, as needed, by one of the tractors.

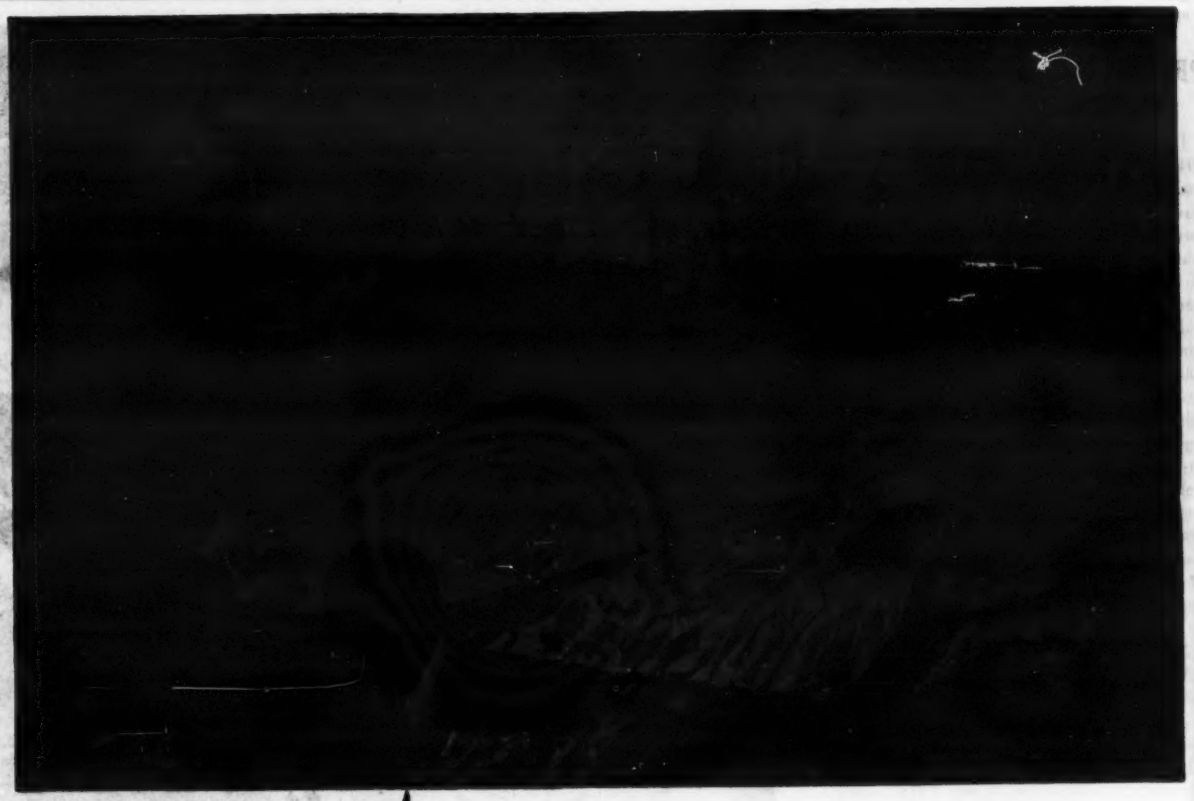


U. S. E. D. Photo
Compaction to 98 per cent standard Proctor was obtained on the Tulsa-West Tulsa, Okla., levee by sheepsfoot rollers.

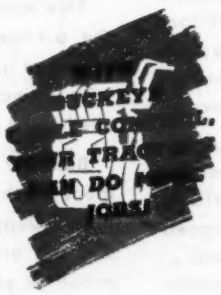
Refueling time was saved by the use of a 700-gallon tank mounted on an International truck which delivered fuel to the units with only short interruptions to their work. A LeRoi and three Simplex electric plants furnished light for night lubricating and repair operations, and six American 6.3-kva light plants, powered by International U-2 motors, furnished light for the night grading operations. Each of the six plants was mounted on pipe skids with an adjustable framework of pipe on which were set six 1,000-watt lamps in reflectors.

Compaction to 98 per cent standard Proctor was obtained on the borrow-pit materials and 95 per cent on the sand fill on the land side of the levee, which amounted to about 20 per cent of the

(Continued on page 74)



"You should have seen those little rats run!"



On fighting fronts all over the world, word has come back of bulldozers in action, not only doing the vital jobs for which they are built, but *fighting* jobs as well. Among the most spectacular of these reports is the following contained in a letter from one of Buckeye's men in service:

"Now here is something I would like to tell you, now that I am back out of New Guinea. We had two pillboxes that were impossible for us to take, so they had a bulldozer about four miles away. We brought it up and by raising the blade charged the boxes. You should have seen those little rats run. We are still laughing. Now let me tell you something—it was a Buckeye blade and a Buckeye winch on the back! Keep up the good work and keep the Japs on the move."

After the war you can count on Cable Controlled Buckeyes to keep *costs* on the run. They've been proved in action — stripped down to fighting trim and built to take a beating. You'll be buying new equipment when it's available again. *Keep your eye on Buckeye!*

BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio

Buckeye

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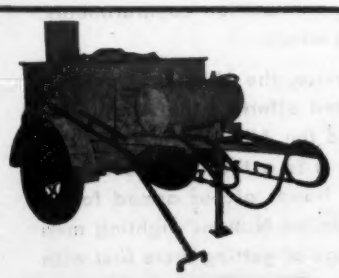
Road Wideners

Convertible Shovels
Spreaders
Power Finegraders



HEATING KETTLES
Fire Proof—Oil Burning
Hand and Motor driven spray. Many sizes. Write for catalog.
White Mfg. Co.
ELKHART INDIANA

New Potomac Bridge Planned To Speed North-South Traffic

Post-war plans of the National Capital Park and Planning Commission to replace the old four-lane U. S. 1 highway bridge over the Potomac River between Arlington, Va., and Washington, D. C., with a single six-lane traffic span utilizing present approaches on both sides of the river were reported in a recent issue of *Highway Highlights*. The new plan for accommodating increased north-south traffic across the Potomac contemplates another heavy-duty bridge east of U. S. 1 to connect Alexandria, Va., with Shepherds Landing, D. C.

Approximately $50,000 in Federal-Aid highway funds are available to draw working plans for the proposed bridge, though it is pointed out that the recommendation of the Planning Commission is only advisory and not binding. Although there is no assurance that the Alexandria bridge will be built, it is deemed advisable in order to re-route heavy traffic on the Baltimore-Richmond route which would enable commercial vehicles to by-pass Washington and would provide easier access to Army and Navy airfields from the south.

Zap, New Type of Gun For Shooting Concrete

A new type of gun, for shooting concrete instead of bullets, was developed by two members of an Aviation Engineers battalion, First Lieut. Robert Wymer of Poland, Ohio, and First Lieut. Carroll M. Henning, Bottineau, N. D. The zap, as it is called, is patterned after the spray paint guns used for painting equipment, and quickly coats with concrete the exterior brick surfaces of Nissen huts.

Made of a cast-off 2-inch pipe and other salvaged material, the zap is T-shaped and uses compressed air for power. Cement and sand are fed into the rear opening of the gun nozzle by means of a rubber tubing which is connected with a 5-gallon gasoline can. The compressed-air hose is attached to the butt of the zap. Water is piped into the nozzle by means of four small jets. The sand and cement are mixed inside the 2-inch pipe, and the mixture with the water is sprayed out by the compressed air.

Well-Known Contractor Dies in Kansas City

Word has been received of the death of Everett Pine Weatherly, President of List & Weatherly Construction Co., at his home in Kansas City, Mo. Mr. Weatherly was a past president of the Associated General Contractors of Missouri, and a member of the American Society of Civil Engineers and the American Railway Engineering Association. Among his construction projects in Kansas City are Van Brunt Boulevard, and the Chestnut Avenue and Beardsley Drive viaducts, the Kansas City water works intake, and bridges on the Kansas City Southern Railway relocation to Grandview. He was an alumnus of the University of Missouri.

ETNYRE *"Black-Topper"*

The Most-Widely-Used Bituminous-Materials Distributor in the World

IS READY!

. . . For War-time rebuilding, maintenance and construction of Roads, Streets, Airports and the coming

POST-WAR ERA

NATION-WIDE SALES and SERVICE ORGANIZATION

Listed below is the Dealer Sales & Service organization behind Etnyre "Black-Toppers"—the most widely used bituminous-materials distributors in the world . . . in the more accurate, faster, less costly and efficient application of all grades of asphalt, tar, road-oils and emulsion, in building, repairing and maintaining roads, streets, airports, soil-stabilization and all black-top surfaces.

This Etnyre organization is at the call and service of highway engineers, road-contractors, municipal officials and airport authorities . . . and all who want the best in black-topping, —just as the U.S. Army, Navy and Allies chose Etnyre "Black-Toppers" to build the military roads, airport bases, etc., in the war all over the world . . . we are ready NOW for the coming POST-WAR ERA.

Consult your Etnyre Dealer now!

ALABAMA
J. D. Pittman Tractor Co., Inc., Birmingham
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Neil B. McGinnis Co., Phoenix

ARKANSAS
Little Rock Road Mach. Co., Little Rock

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COLORADO
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IDAHO
Intermountain Equipment Co., Boise

ILLINOIS
INDIANA
E. D. Etnyre & Co., Oregon, Illinois

IOWA
Waterloo Construction Co., Waterloo

KANSAS
G. W. Van Keppel Co., Kansas City, Missouri

KENTUCKY
Frankfort Equipment Co., Frankfort

LOUISIANA
Louisiana Tractor & Equipment Co., Baton Rouge

MICHIGAN
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C. & E. M. Photo
The use of unit steel forms speeded the pouring of the 12-inch walls of the 65-foot-diameter sludge-digestion tank at an Air Depot in the south. In the upper right is the 18-inch influent line.

Airfield Sewage Plant Built with Unit Forms

(*Continued from page 9*)

foot piles with 8 x 8-inch caps 5 feet long held to the piles by 3-inch metal straps with ⅜-inch bolts. The stringers are 8 x 8-inch timber, 14 feet long, alternating on the bents so that there are four on each. The pipe is held by two pieces of 3 x 10-inch lumber on each side, beveled to fit the pipe and carried by 4 x 4-inch transverse timbers 18 inches on centers and with a pair of 2 x 6-inch planks on one side to serve as a walk-way.

At the downstream end of the 24-inch pipe, the sewage flows into an open concrete ditch supported on 20-foot piles and then into an unsupported section.

The swamp through which the outfall sewer runs was cleared on both sides of the pipe for a distance equal to the height of the highest tree plus 5 feet. This protects the line from falling timber in event of high wind at a later date. A corduroy road covered with earth was laid for the operation of a crane during construction and is to be continued for serving the line.

Steel and Wood Forms

The sludge digester, which has an inside diameter of 65 feet and a uniform wall thickness of 12 inches, except at the control house where it is 20 inches thick, was poured entirely with Economy steel forms. The hopper bottom is 10 feet deep with a 1-foot bottom slab and radial reinforcement running from the filter to a 1-foot 6-inch spacing at the perimeter. The reinforcing is uniformly ½-inch round steel 20 feet long for the hopper bottom. Upon completion, the digester was backfilled on the outside to within 6 feet of the top of the structure with selected material and with crushed stone for 2 feet adjacent to the concrete walls for drainage. The backfill was topped with 6 inches of black soil to speed the growth of grass.

The Economy forms, which were leased with the erection crews from Economy Forms Corp., Des Moines, Iowa, are made of sheet metal with the edges flanged to provide strength and to speed the assembly with the special clips designed for this purpose. The forms used on the circular digester were 30 x 30, 30 x 12, 30 x 6, and 30 x 3 inches, the last being a flexible form to permit curving the surface. The 30-inch span of the steel form created a chord in the circumference of the 65-foot diameter digester that was only ⅛ inch maximum from the arc. In assembling the forms for the digester, 2 x 4-inch studs were clipped to the flanges of the forms as stiffeners on 30-inch centers.

The steel forms were also used for the grit chamber, screen chamber and clarifier as well as the sludge-bed walls. Because of the special shape of the Parshall flume, a wood form for that structure was made of ¼-inch Masonite backed by 6 x 1-inch tongue-and-groove lumber with 2 x 4-inch studs on 12-inch centers and diagonal ties as well as top and bottom spacers to give the proper proportion for the open Venturi-type measuring device.

Equipment for the carpenters working on forms and other woodwork on this project included an American Sawmill Machinery Co. Monarch bench saw with a Master electric motor. A Millers Falls Co. double power grinder was installed for speedy sharpening of the saws and a

(*Concluded on next page*)

C. & E. M. Photo
The 530-foot outfall sewer of 24-inch plain-concrete pipe is carried on a low pile trestle through a wide clearing in the swamp.

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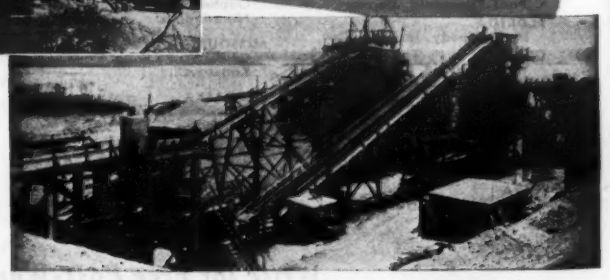

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1 Fast-cutting Pole Saw 14½ ft.
If other lengths are required, specify extra sections 4 or 8 ft. long, to make the necessary length.

Concreting Methods For New Sewage Plant

(*Continued from preceding page*)

U. S. Electric Tool Co. ½-inch and a ¾-inch Millers Falls electric hand drill were provided. Inasmuch as it was necessary to operate these drills out in the swamp areas in building the trestles, where it would have been expensive to install a power line, the contractor mounted a Master electric generator on skids so that it could be moved readily into the swamps close to where drilling was being done.

Concreting Methods

The sewage-treatment plant, built entirely of concrete, consists of a double-channel grit chamber with a total width of 15 feet, a bar screen, the Parshall flume, a clarifier 35 feet wide and 100 feet long and averaging 11 feet deep, the circular digester, 32 feet deep, and 14 sludge beds each 76 feet long and 29 feet wide. These are separated by plain-concrete walls.

The specifications covering concreting the structures of the sewage-treatment plant required that the contractor maintain a power mixer not smaller than a 14-S on the job ready to operate at any time. In order to insure that the specifications were fulfilled, the inspector required that the first batch of each pour each day be made by the old Koehring 14-E paver which the contractor installed on the job to meet this requirement. This machine was mounted on half-crawlers and steel wheels.

All of the remaining concreting was done with ready-mixed concrete hauled 2 miles by Rex 2-yard Moto-Mixers operating as agitator trucks. In pouring the digester, which was the most difficult of all the structures, three steel chutes and two wooden chutes were used to deliver the concrete from the Blaw-Knox Roller-Gate bottom-dump bucket which was handled by one of the Northwest cranes. This delivered the concrete to the wood hoppers at the top of the various chutes. The digester was poured in three 90-inch lifts after the initial pour of 250 yards for the hopper bottom. Each 90-inch lift required about 80 cubic yards. The concrete was vibrated during placing by two mechanical and two Ingersoll-Rand air vibrators.

Personnel

Holabird & Root of Chicago were Architects-Engineers for this project, with Southeastern Engineering Corp., Atlanta, Ga., the general contractor, and W. C. Shepherd of Atlanta, Ga., subcontractor on the outfall sewer. The work was done under the direction of The District Engineer, U. S. Engineer Department, Savannah, Ga., with Major E. B. Boynton as Area Engineer.

V-Belt Drive Catalog

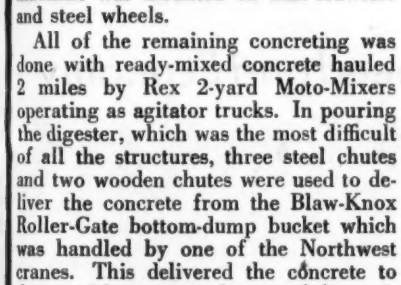
A catalog describing and illustrating its complete line of Texrope V-belt drive units, with sheaves from the single-groove light-weight design up to the special 3,000-hp multiple-groove size, and belts for ⅛ to 2,000 hp, has been released by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Various types of electric motors are also illustrated, and their applications for the different types of belt described. In the face of restrictions on low-speed and multi-speed motors, various combinations of Allis-Chalmers motors and drives are suggested for flexibility and efficiency.

Copies of this bulletin may be secured from the Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Please mention this item.

Operation and Care Of Cranes and Shovels

A complete operation manual for the Browning line of both crawler and rubber-tired cranes and shovels, covering various types of clutches, correct manipulation of brakes, engine and transmission units, boom hoist clutch and brake, and the proper procedures for dragline work, has been issued. Included also are lubrication instructions, with photographs and charts to facilitate the lubrication of all parts of this type of machinery.

Copies of these helpful operating and lubricating instructions will be sent upon request to the Browning Crane & Shovel Co., 16226 Waterloo Road, N. E., Cleveland 10, Ohio. Please mention this publication.



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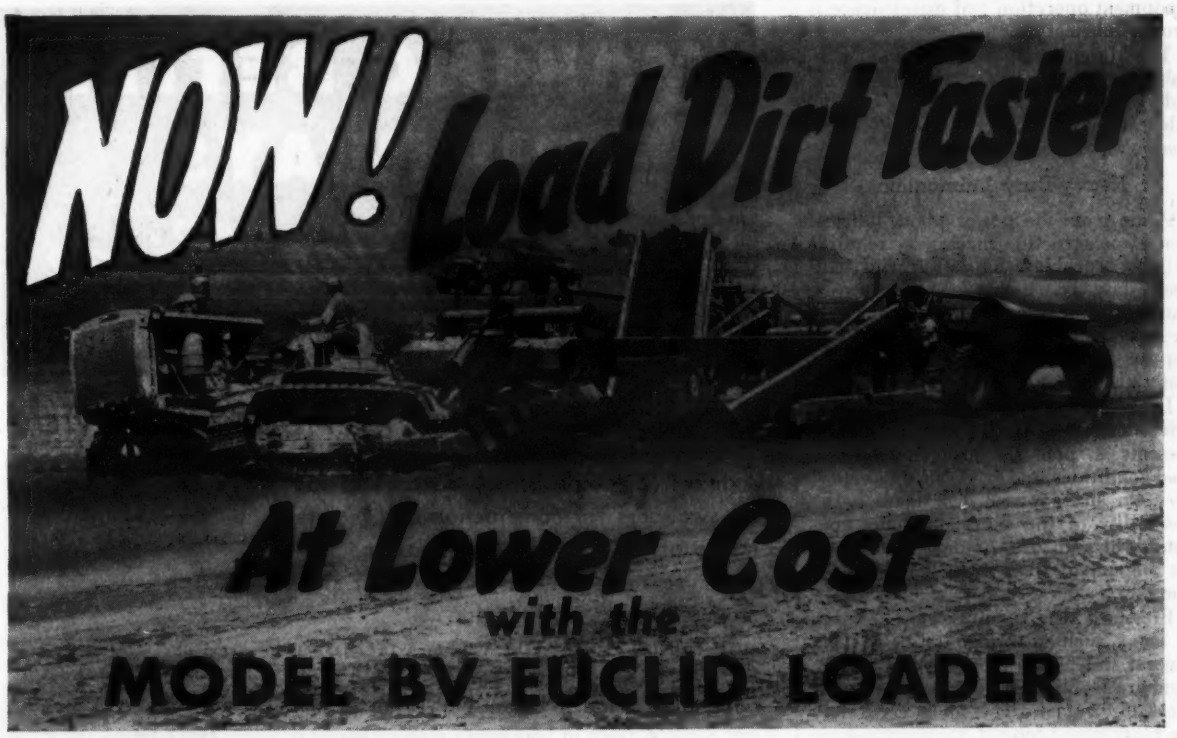

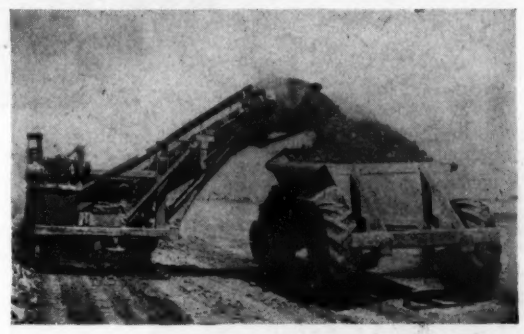

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✦ PROPER care of construction and maintenance equipment has always been a sound business practice, in order to secure the maximum efficiency from one's machines, avoid costly delays due to breakdowns, and to protect the investment made in the equipment, whether by contractors or state and county highway departments. Today, faced with the unavailability of new equipment and the lack of spare parts, owners of construction and highway-maintenance equipment are deeply concerned with the problem of making present machines last. One of the most vital factors in equipment operation and maintenance is proper lubrication.

The March issue of *Lubrication*, published by The Texas Co., contains an article on construction machinery and its lubrication which, because of its pertinency, we are reprinting in part.

Heavy-Duty Lubrication

Aside from the power plant, lubrication of construction machinery requires primary consideration of gearing and heavy-duty bearings; in other words, parts which, if worn to excess, may cause the machines to operate inefficiently or require replacement with "hard-to-get" materials.

Lubrication of power-transmission drives and speed-reduction gears always presents a potential problem, due to load conditions and frequently to exposure. On any exposed gear there is the possibility of the lubricant being contaminated with dirt or dust to increase the amount of wear and alter the pitch line.

Pressure also requires consideration in many such gear installations. As a general rule, the tooth pressures are comparatively high, due to the small areas of contact. The more accurately the gears have been cut, the more intense the unit pressure, as line contact more nearly prevails. Gear-tooth pressures change constantly as opposing teeth mesh with each other, which causes change in the direction of application of the load. As long as rolling motion predominates, the effect on the structure of the teeth is not serious. When wear occurs, however, there is a tendency for the motion between the teeth to become sliding instead of rolling, causing a certain amount of grinding between the teeth, which in turn causes more wear, especially if lubrication is not maintained in an effective manner.

To offset this, a gear lubricant should possess a high degree of lubricating ability. A realization of this fact prompted intensive study of gear lubricants during the past decade and resulted in the development of both straight mineral and E. P. products of vastly improved film strength commensurate with the viscosity or fluidity. This enabled gear engineers in turn to adopt more precise methods of cutting and to some extent to produce gears of a higher load-carrying capacity for the same tooth area.

Temperature, of course, affects the fluidity, although in the normal operation of construction machinery, gears function at atmospheric temperature. As a result, there is but little possibility of the gear lubricant being reduced in viscosity by abnormal heat. The effect which low temperature may have upon a gear lubricant in service, however, requires more consideration. Certain grades of lubricants will have a tendency to congeal to such an extent as to become brittle and crack. If a lubricant has been properly refined, however, there should be little danger of this occurring.

Crawler tracks on both tractors and excavators are usually equipped with lubrication fittings specially designed to keep out dirt and prevent damage. Here the track rolls on a Marion shovel "get the gun".

The average range in viscosity for service on exposed gears varies from approximately 1,000 to 2,000 seconds Saybolt at 210 degrees F, the lubricant being chosen to meet the operating temperatures and size of gears. Where gears are enclosed, a more fluid lubricant is advisable. The same holds true for the average silent chain drive where comparatively low clearances prevail between the link mechanisms. The lubricant, of course, must be capable of penetrating to all surfaces of contact between these parts; otherwise, abnormal wear may develop. Here a lubricant of about the same viscosity as a heavy steam cylinder oil, in the neighborhood

(*Continued on page* 58)

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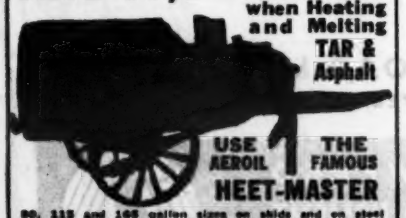

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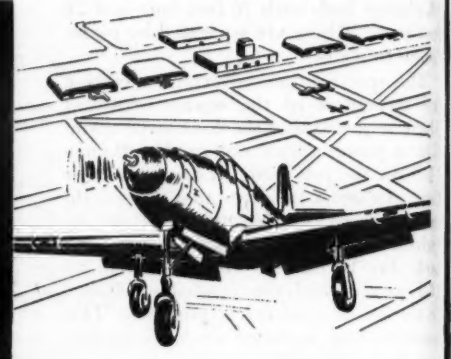

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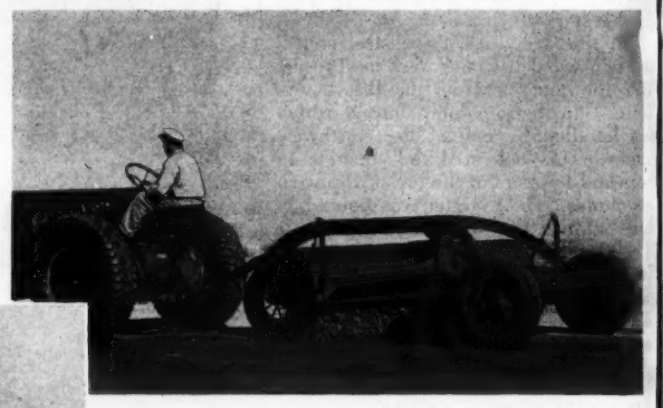

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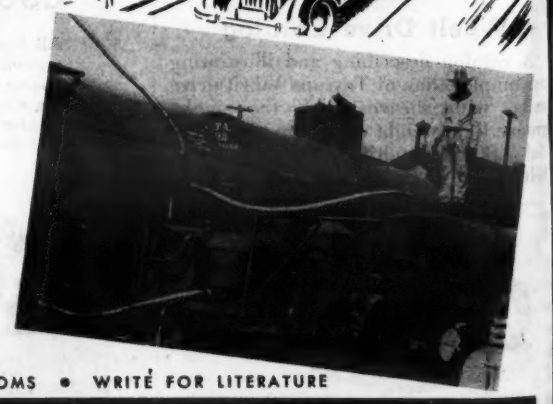

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The new Diamond dual-action crusher.

Unit Crushes, Rolls In Single Operation

A new development in jaw-crusher construction is a feature of the Diamond dual-action crusher which is soon to be put on the market. This piece of equipment, weighing little more than half of the combined weights of the conventional jaw and roll crushers, does the job of both in one operation, according to the manufacturer. Instead of the usual procedure of screening the material through to the jaw and roll, and then returning the product through for reclassification, all the material can be fed to the Diamond unit where, after the upper jaw has accomplished sufficient fracture, the material is released to the lower combination of movable concave jaw and rotating roll which finishes the fracture and delivers a product crushed to size and of correct rectangular shape, with a minimum of oversize and slivers. It is reported that actual performance has shown the Diamond dual-action crusher will more than equal the production of the usual jaw and roll combined.

This new crusher is of rugged, all-welded construction, and is equipped with heavy double chain drives and a new type double-wedge toggle adjustment. It comes in two sizes, 10 x 20 x 26 feet and 10 x 36 x 30 feet, with capacities up to 60-80 tons of 2-inch material per hour. Because of its smaller size, this compact unit is particularly applicable for portable plants, and also because it affords economy in time of production and in operating costs.

An illustrated bulletin, D-44-M, and assistance in selecting the proper-size crusher for individual requirements, will be supplied upon application to the Diamond Iron Works, Inc., Minneapolis, Minn. Please mention this publication.

Scrapers Move Muck From Apron Subgrade

A conventional job turned into an unusual one is generally reported from the front lines where Combat Engineers or the Seabees are active. We have one from a southern airport where 75,000 cubic yards of muck was removed from a hole about 1,400 x 300 feet in area, and about 3 to 4 feet deep. The muck had to come out quickly, as it was located in an area ordered converted at once into a parking apron for Liberator four-engine bombers.

This would have been a quick job for a few draglines and trucks or Euclids, but none was available from the nearest equipment pool. The Area Engineer had ten Tournapulls available, so he set them to work, using a total of three D8's as pushers and three more for pulling. The Tournapulls were run first with one set of wheels on solid ground and the others in the muck, working into the hole as the muck was removed at the edge. The muck was disposed of in an old state highway department borrow pit about 1,500 feet distant, and will probably show up at some later date as topsoil for shoulders or backslopes on a highway job.

The muck hole was backfilled with selected material from a sand-clay cut only 300 feet distant from the hole. All this sounds rather simple, but there were several very heavy rains during the cleaning out of the muck hole, and grading at that particular field was confined to 9 days in one month because of the severe rains.

Hard-Surfacing Alloy For Economical Work

A line of hard-surfacing rods for application by either the electric or acetylene welding process is made by the Mir-O-Col Alloy Steel Co., 2416 E. 53rd St., Los Angeles 11, Calif. These Mir-O-Col rods are available for general use, in 1/8, 5/32, 3/16, 1/4, 5/16, and 3/8-inch sizes, with black coating for electric application and white coating for the acetylene process. The Rockwell C Scale hardness is 55, the Brinell hardness is 555, and the manufacturer states that the metal is extremely tough for this high hardness. Rods for special services are available in varying sizes and degrees of hardness.

Scientifically alloyed to provide maximum wear, Mir-O-Col rods leave a deposit which resists abrasion, wear and heavy shock, and can be used for hard-surfacing bucket and dipper teeth, grader and snow-plow blades, crusher teeth, rolls and jaws, concrete mixer blades, traction treads, and rebuilding worn parts of construction equipment to return them to service and lengthen their working life.

In a handy-size 28-page Welders Guide, the uses of hard-surfacing rod, the application of Mir-O-Col rod by both the electric and acetylene process, proper welding procedure, things to remember and avoid, and details on the various types of Mir-O-Col rods and their uses are described in detail. Copies of this Welders Guide may be secured by those interested direct from the manufacturer. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

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New Location Costs Less Than Widening

(*Continued from page* 13)

widening of present rights-of-way. Where such required changes are numerous, the acquirement of entirely new right-of-way will generally be found cheaper than widening and correcting the right-of-way of the existing road. The latter course will involve large taking of property frontage, always the most expensive of land acquisitions, and usually will entail also a heavy cost in incidental damages. The former, by avoiding existing frontage, will usually result in lower total costs, notwithstanding the severance damages that may be involved. For example, it was estimated that the cost of land for widening the Albany Post Road in Westchester County, N. Y., from 66 to 166 feet would have been over $792,000 per mile, while land for the Saw Mill River Parkway, of limited-access design on entirely undeveloped new location and averaging 500 feet in width, cost only $138,600 per mile.

In and around cities the widening of existing rights-of-way is likely to be especially costly because of the high values usually attached to urban street frontage and the improvements and structures characteristic of urban areas. In most cases of widening within cities, the additional width acquired at each side of the street to be improved is less than the full depth of abutting property lots. It is probable that the cost would not be materially higher if the entire depth of abutting lots were taken; for, as a general rule, it is found that the acquisition of whole parcels of city property is seldom more expensive than the taking of a portion, because of the heavy payment usually required in consequential damages to the untaken remainder.

The minimum width of right-of-way required for urban sections of the Interregional System will generally be at least as great as the depth of city property lots. Where such a width is to be taken it will be preferable, both for the avoidance of remnants and from the standpoint of cost, to take the whole depth of a tier of lots on one side of an existing street rather than half portions of the lots on opposite frontage.

In most instances, however, the Committee believes that a fully adequate provision for city sections of the system will require the acquisition of a block-wide strip. This will permit the retention of streets flanking the acquired block as the essential local service ways of the express artery. It will avoid exposure of the rear of properties, will reduce by as much as possible the effect of depression upon city underground facilities by leaving those in the beds of the flanking streets undisturbed, and will at the same time afford a sufficient width for adequate landscaping.

Right-of-Way in Rural Areas

On rural sections of the system, especially those sections which will be constructed initially as two-lane highways, the width of right-of-way acquired should be sufficient to provide for any surface widening that may be reasonably anticipated. Nothing is more completely demonstrated by past experience than the costliness of successive acquisitions of property frontage to make room for repeated unanticipated road widenings.

The width acquired should also be sufficient to accommodate, at each side of the roadway in its eventual anticipated width, marginal strips of land to serve as a protection against the unsafe and unsightly development of closely crowding roadside stands, filling stations, and signboards.

Unfortunately, the expropriation of width additional to that required for the physical improvements immediately planned is specifically sanctioned by law only in California, Massachusetts, Michigan, New York, Ohio, Pennsylvania, Rhode Island, Virginia, and Wisconsin. Cases in which such proposed takings have been tested in the courts have been complicated with a purpose to resell a portion of the land acquired and with the presumption of a motive to recoup a portion of the cost of the land retained by profiting on the sale of the excess. It is evident the courts have not been persuaded that the acquisition of marginal strips, even for future roadway widening or for present border protection, is an appropriation for a "public use", the test to which they firmly adhere in determination of the validity of all expropriation.

Various exercises of the police power for control of roadside land use, as exemplified by present practices of zoning and billboard regulation, may serve temporarily and partially as substitutes for the outright public acquisition of road-bordering strips. They can never constitute a permanent overall solution of the problems involved but, with proper revision, enlargement and effective application, they can become valuable auxiliary devices for the regulation of land uses detrimental to the safe and efficient use of the highways. A good example of legislation providing for such use of police power is to be found in the statutes of Pennsylvania.

As a better substitute for outright acquisition, the Committee recommends the public appropriation of what may be termed "highway development rights", i.e., the rights of owners of

(*Concluded on next page*)

. . . Designed and Built by Steam Generator Experts

TRIM — compact — highly perfected, the Cleaver-Brooks Tank-Car Heater looks and performs like the "finished" product it is.

No other equipment equals Cleaver-Brooks in fast, low-cost, dependable performance—no other equipment has the original and exclusive four-pass, down-draft flue travel and integral fuel-oil burner construction, plus the *perfected* positive dry-coil method of condensate return.

Cleaver-Brooks design and construction provides more and better steam—faster with far less fuel and water. Hot, dry steam flows to car coils in 25 minutes or less —there is no "water-wagon" problem as every drop of condensate is returned to the car heater under pressure.

Cleaver-Brooks heaters are the perfected product of the pioneers and originators of tank-car heaters and bituminous boosters—built by specialists in the construction of portable and stationary steam generators for construction, industrial and military uses. Military engineers usually assign Cleaver-Brooks equipment to the difficult jobs — the hardest chores — because they recognize Cleaver-Brooks' proven capacity and reliability.

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TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

SPEED WORK WITH

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TARPAULINS and WINDBREAKS

Protection when you need it can save many man hours on the job. FULTEX Waterproof Tarpaulins and Covers are well known and widely used. They have proven their quality through heavy duty and long wear. You get your money's worth when you buy FULTEX.

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Manufacturers since 1870
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Acquire Land Jointly Along Future Highways

(*Continued from preceding page*)

private property abutting on highways to improve road-marginal strips of their property in any manner inconsistent with present or future traffic requirements. Because of the legal limitations of the police power, establishment of the right to acquire such control should be conceived rather as an exercise of the power of eminent domain, for which compensation would be forthcoming. It is taken for granted that state enabling legislation would be necessary, and a prototype of such legislation exists in a Maryland law enacted in 1941.

Compensation for such rights would be nominal in most instances, because the payment would be made for only actual demonstrable injury, and because the right would be acquired usually at the time when land is being taken for immediate highway improvement, often on new location in undeveloped areas. If the margins thus taken under control are later required for expansion of the road facility, as must inevitably be the case in many instances, the acquisition costs will be at a minimum because of the arrested development of the lands affected.

Joint Acquisition

The Committee recommends, wherever possible, that lands needed for development of the Interregional Highway System be acquired in conjunction with the acquisition of lands for adacent housing, airport, park, or other public developments which the highways will be designed in part to serve. The mutual benefits of such a simultaneous and cooperative program of land assembly, the Committee believes, will be reflected in lower land costs, in a more rational land-use pattern, and in the elimination of all possible focal points of conflict between the various improvement programs concerned.

To deal competently with legal, financial, and administrative problems of such interrelated and mutually beneficial land acquisitions, the Committee recognizes a need for the creation of special land authorities, adequately empowered and financed, to acquire all lands needed for public purposes of any sort.

Wartime Transport Over Ancient Route

Army Ordnance troops stationed near the site of the Garden of Eden in Iran, formerly Persia, rendered epic service in helping to sustain Russia's 1943 offensive against Germany. Their contribution consists of assembling all types of automotive equipment at Khorramshahr, near the head of the Persian Gulf, and maintaining huge cargo fleets of ordnance and other combat supplies rolling toward the Russian front over 800 miles of desert and mountainous road across Iran to Pahlevi on the Caspian Sea.

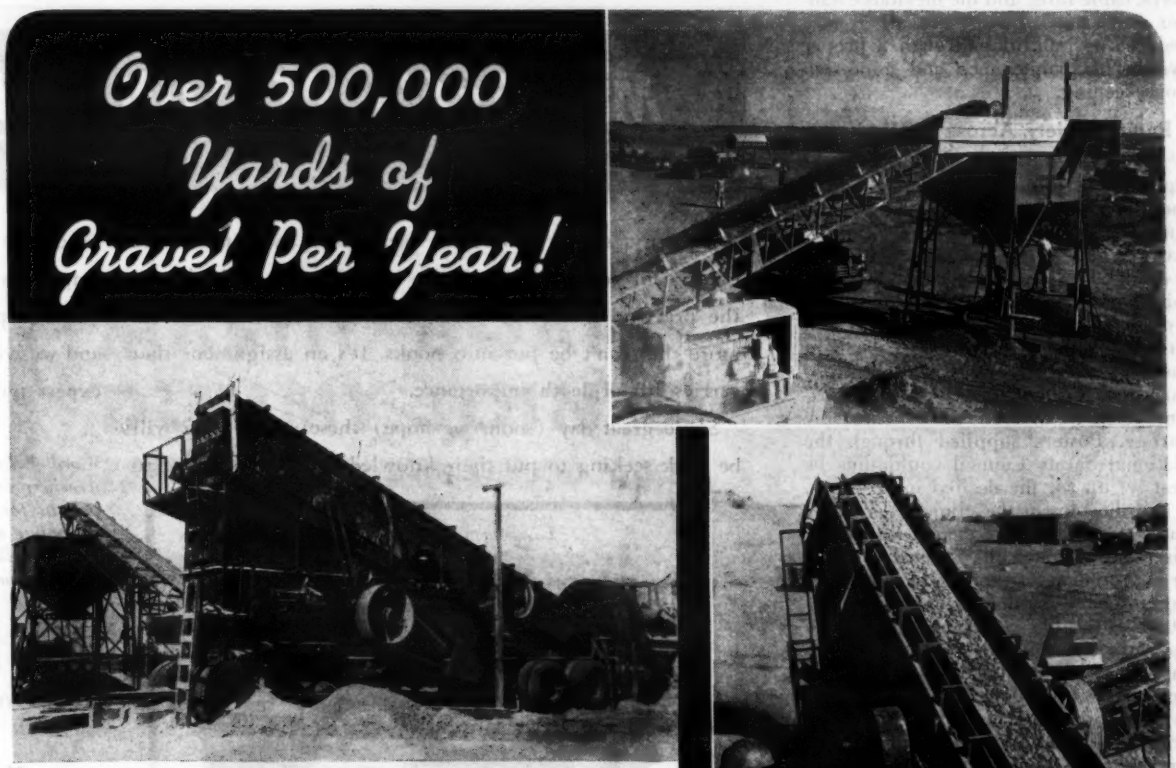
Iran has been crossed by transport routes for many hundreds of years. Alexander the Great, Genghis Khan and Marco Polo used them. Roman legions under Mark Antony tried to take them over, failed, and stayed as prisoners to work on them. Yet for nearly 2,000 years, these historic routes remained little more than camel trails until the Shah of Iran decided to build a railway and a highway system. By 1938, he had completed an 800-mile railroad and a 500-mile highway through the mountains.

The United States developed the port facilities, punched an all-weather road through the desert, set up service depots and transfer stations, and has sent an immense volume of Army Ordnance equipment through the completed corridor to Russia. Some stretches of the road are so rough that truck tires split to shreds after rolling only 4,000 miles; on others the dust is so thick that the drivers wear respirators. Seven-ton Army trucks are used to transport the equipment. The gasoline, obtained from nearby wells, is British; but the oils and greases used are American.

Working in 180-degree sun temperatures, in high humidities, in sandstorms, in ankle-deep mud, Army Ordnance personnel is shipping to Russia eleven times more tonnage than was hauled over the Burma Road in its peak month of operation.

Cement Co. Official Dies

Benjamin Franklin Affleck, a Director and retired President of the Universal Atlas Cement Co., New York City, died suddenly on February 13 at his home in Winnetka, Ill. Beginning his long career at the age of 14, as a machinist, Mr. Affleck rose to the position of General Sales Manager of the Universal Portland Cement Co. in 1915, then became President, and continued in that position after the purchase of the assets of the Atlas Portland Cement Co. in January, 1930. He retired from the presidency of Universal Atlas Cement Co. in 1936, but remained a Director until his death.



Success stories of Universal plants are many. Typical is the one recently received from Cage Bros. & J. Floyd Malcolm, Texas, gravel producers. They have given us the following report on their Universal Gravel Crushing, Screening and Loading Plant:

Maximum yardage per hour: 400 yards of material 2" and under.

Average production in continuous operation: 275 yards per hour.

Average annual production: over 500,000 yards.

This compact portable plant consists of a 1036 primary jaw crusher, 40"x 24" secondary roll crusher, 2½ deck 4'x 12' screen, rotovator and conveyors—a lot of gravel produced with a minimum of equipment.

Ask any user of Universal equipment about production costs, fuel consumption, bearing life, maintenance costs and other operating factors. *When results are checked, Universal is the choice!*

UNIVERSAL ENGINEERING CORP.
620 C Avenue, West Cedar Rapids, Iowa

Get Behind the A.R.B.A.!

Officials of the American Road Builders' Association have issued a plea to members, affiliated organizations and other interested parties to launch a well integrated post-war highway building program at once so that the wheels can be set in motion immediately upon conclusion of the war.

A copy of "A Sound Plan," detailing the program to hedge against post-war deflation is available to those interested, from the A.R.B.A., 1319 F St. N. W., Washington, D. C.

ARMY E NAVY
UNIVERSAL
CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADERROLLERS, PORTABLE ASPHALT PLANTS

Planning for Safety On Construction Jobs

(*Continued from page* 10)

line of defense in cutting down lost time from the accidents which are bound to occur, but the multitude of minor accidents can be diminished only when management and workers together realize that "a clean job is a safe job".

Good Job Housekeeping

Having then passed through the first phase, the impression to be made on the worker that safety is largely in his own hands becomes a matter of simple procedure. All aspects of cleanliness on the job come from proper planning, through the foreman, in the matter of piling waste material out of the way to be forthwith disposed of away from the working area.

Accidents caused by platforms, slings, stays, cable falls, and the inevitable danger from nail wounds, are all greatly reduced as liabilities through a proper system of maintenance and good job housekeeping.

Putting Safety Across to Workers

Glass-door bulletin boards with night lighting at the clinic, supply house, men's quarters, operating shops, and timekeepers' offices serve as a medium of daily reminder for many activities. It was found on one project that the periodic changing of posters covering war-worker stimulation, war bonds, Red Cross, and Safety First features caught the eye by the rotation of subjects, so that none lost any effect by the short-time display, but rather benefited by variety. Posters supplied through the National Safety Council could thus be best set up for the desired impressions.

A follow-up of the clinic records, by gangs, passed on to them with verbal discussion through the general foreman or subforeman, created more interest in safe job handling than a continuing multitude of meetings, which as a rule take up work time and do not get down to cases that are applicable to all activities alike. A word on a particular case to a responsible foreman, during the "rounds" of the job by the superintendent or project manager, usually gets more rapid correction and is more impressive as to the need for that correction than can be obtained in a generally attended meeting.

Safety Must Be Planned

The opening wedge in a Safety First program on any construction job is for management first to plan and buy the things needed for Safety First, and to install and maintain all the necessary facilities, thus starting the job off right, instead of letting the job just grow up. Next comes management's task of selling Safety First to the workmen, which can best be accomplished through the human eye. It follows then that if management plans and invests in Safety First and keeps the principles of Safety First before the workers, the men on the job are more likely to practice Safety First. The result is that the worker can carry on his job with comfort, ease and safety, and therefore forms the habit of working well.

American Standards Covering All Fields

The American Standards Association, 29 West 39th St., New York 18, N.Y., has announced the publication of a new list of more than 600 standards, of which 64 have been approved or revised since the last price list was printed in April, 1943. These standards cover specifications for materials, methods of tests, dimensions, definitions of technical terms, procedures, etc.

In the field of safety engineering there are 95 new standards. American Standards are constantly revised to keep up with the advance in industrial methods. This list represents the cumulative work of the past 25 years in practically every engineering, construction, and industrial field.

The complete list of American Standards serves as a valuable reference for engineers, manufacturers, purchasing agents, etc., and a copy will be sent free of charge to anyone interested by addressing The American Standards Association and mentioning this item.

New Catalog Describes Line of Power Take-Offs

A new illustrated folder describing the use of Davey power take-offs from truck engines to power auxiliary units such as pumps, generators, air compressors, concrete mixers, welders and kindred equipment, is available from the Power Take-Off Division, Davey Compressor Co., Kent, Ohio. The folder outlines the development of the power take-off, its construction, and its advantages in modern industrial use, and gives specifications of the three standard Davey models.

Copies of Bulletin E-166 will be sent upon request to the manufacturer. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

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"Simplified" ARC WELDING
If you haven't taken advantage of welding, you are missing out on the most versatile tool ever offered the construction industry for both production and maintenance. Hobart "Simplified" Arc Welders, gas engine driven, with exclusive Remote Control are the best welders you can buy for your work. Ask for details.
"PRACTICAL DESIGN FOR ARC WELDING" is a service that will show you what has been done in the construction field. FREE! Ask for it.
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Write for the Hobart Welder Catalog today. No obligation.
HOBART BROTHERS CO., Box CE-44, TROY, OHIO
"One of the World's Largest Builders of Arc Welders"

MR. 6x6'S PERSONAL PHYSICIAN!

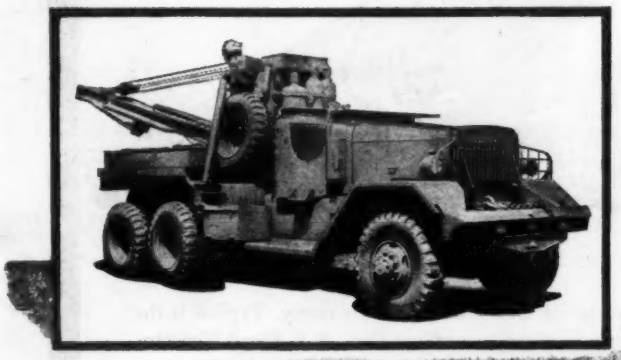
● When a soldier's job is to keep Uncle Sam's motorized equipment rolling through the battle zones, he learns all the practical know-how there is in the book — plus a lot more that can't be put into books. It's an assignment that carries life-or-death importance.

Some great day (soon, we hope) these young men will be back seeking to put their knowledge and experience to peacetime use. Wise and fortunate will be the employers who make the most of them!

Our reputation today rests with Army men, and we will gladly rest our *postwar* case on their expert judgment of Ward LaFrance trucks.

* * *

Ward LaFrance's wartime assignment includes heavy wreckers for tank-recovery work, as well as fire apparatus for Army, Navy, and essential civilian needs. Peacetime manufacturers of fire apparatus, commercial dump trucks, plows, cranes, gas and Diesel over-the-road tractors.



WARD LaFRANCE

TRUCK DIVISION, GREAT AMERICAN INDUSTRIES, INC.

ELMIRA GAI NEW YORK

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

A Lesson in Contract-Making

Rarely does a single opinion of a court afford so much legal information of interest to contractors as does that lately rendered by United States District Judge Leahy of Delaware in the case of State of Delaware v. Massachusetts Bonding & Insurance Co., 49 Fed. Supp. 467.

The decision deals with the validity of oral modification of contracts, the power of agents to modify agreements, the amount of damages that are recoverable for breach of a contract to sell and deliver construction materials, and with what law governs in a case where a contract is made in one state and is to be performed in another, and the laws of the two states differ.

The suit was brought on behalf of a crushed stone company to recover against a highway contractor's bonding company for material sold, and involved a counterclaim by the contractor for failure to deliver other material. The counterclaim was based upon an alleged verbal modification of the written contract sued upon, under which modification the contractor claimed that the stone company bound itself to sell and deliver an increased quantity of materials. It was asserted that the modification was agreed to by a *salesman* of the stone company. The salesman was dead when the case was tried.

No Valid Modification Proved

The court decided that the contractor failed to prove a valid modification of the original contract, under the following governing principles of law:

"Where an oral modification of an earlier written contract is alleged, and denied by the other party, the one resting on such modification has a heavy burden to establish the fact of modification against the other who denies it. * * *

"At the outset, it is obvious Souders" (the salesman) "had no authority—apparent or implied—to bind" the stone company on the original contract. (The court founded that decision upon the point that the original contract recited that it was not binding upon the company until accepted by one of its officers.)

"Even *an agent*," continues the opinion of the court, "*who has authority to enter into a contract* on behalf of the principal, does not have authority to *alter* its terms. * * *

"Clearly, Souders was a salesman. * * * As such, he was merely an agent to solicit orders and transmit them to his principal for approval or rejection. * * * The fact that one is a traveling salesman employed to sell products warrants no inference that by virtue of such employment he is authorized to make a contract of sale binding his principal without approval or acceptance. * * *

"When the contract for the sale of stone was executed by" the contractor, "and forwarded by Souders to his principal for acceptance or rejection, the agent's authority with respect to that particular contract ceased. One year after the contract had been accepted, Souders was not designated as the person to whom shipping orders were to be given for he had *no authority relating to shipments*. An agent who negotiates a contract is not generally the person to whom the other party to such agreement is to give notice in connection therewith."

No Basis for Damage Award Proved

But the court declared that even if a valid modification of the original agreement of sale had been proved, no basis for an assessment of substantial damages was established.

The contractor asked damages on the theory that failure to deliver stone on time entailed extra expense on account of equipment rental, extra labor, penalties under the construction contract, etc. But the court found that these items of loss were not recoverable because there was no proof that they resulted as a direct and natural consequence of any delay in delivery chargeable to the stone company. The court said: "The burden rested at all times on" the contractor "to show not only a breach of contract but also loss flowing therefrom would not have occurred except for" the stone company's "conduct."

Duty to Reduce Loss

Furthermore, the court ruled that, because the evidence showed substitute materials could have been bought in the local market at no increase in cost, no substantial loss was caused the contractor by the stone company, even if it be conceded that the latter did break its contract. Under such circumstances, declared the court, the contractor was bound to make a reasonable effort to minimize his damages.

Which State's Laws Apply?

Confronted by questions whether rights to damages and interest were governed by the laws of Pennsylvania, where the stone company's office was located and whence shipments were made, or by the laws of Delaware, where the construction work was to be performed and therefore the destination of the shipments, the court concluded: The sales contract was a Pennsylvania contract, because accepted in that state. Moreover, the contract provided for f.o.b. delivery in Pennsylvania, which meant that the stone company fully performed its agreement by loading the stone on cars in Pennsylvania.

In a concluding summary of the points decided by Judge Leahy, he notes this well-established rule of law:

"Damages which are uncertain, contingent or speculative cannot be made the basis of recovery. In order for damages to be recoverable they must be susceptible of ascertainment as to amount within a reasonable degree of certainty. The damages must be certain both in their nature and in respect of the cause from which they proceed."

Optional Equipment Leases

Additional slants on contract-making are illustrated by the decision reached by the United States Circuit Court of Appeals, Fourth Circuit, in another recent case—G. T. Fogle & Co. v. United States, 135 Fed. 2d, 117. That case involves the principle that a contract may be so worded as to give a party an option whether or not he will call for—and accordingly pay for—materials or services covered by the agreement. It was decided that the Government was not liable for the rental of construction equipment which it never used.

The court started out with the well-settled rule that a contract must be read as a whole, with effect given to each provision thereof in order to arrive at the true intention of the parties.

After reviewing the provisions of the contract, the court said:

"It is true that Fogle would thus assume the risk of furnishing equipment which might never be used; but contracts must be given effect in accordance with their terms, and rates of compensation and the conditions provided therein are conclusive upon the parties. * * * There was imposed upon the Government no *duty* to use the equipment."

But the court did recognize that there was an obligation on the part of the Government to act in good faith in the matter and to use the equipment if it were actually needed. On the other hand, there was no evidence to show that the Government did not act in good faith in failing to use the equipment.

Pre-War Deficiencies plus War-Deferred Construction and Maintenance plus Added Facilities for Increases in Motor Vehicle Use equal Post-War Highway Needs.

TRANSITS and LEVELS
HEADQUARTERS for REPAIRS—any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalog EC-94 of Engineering Instruments, Engineering Field Equipment and Drafting Room supplies.

WARREN-KNIGHT CO.
Mfrs. of Sterling Transits & Levels
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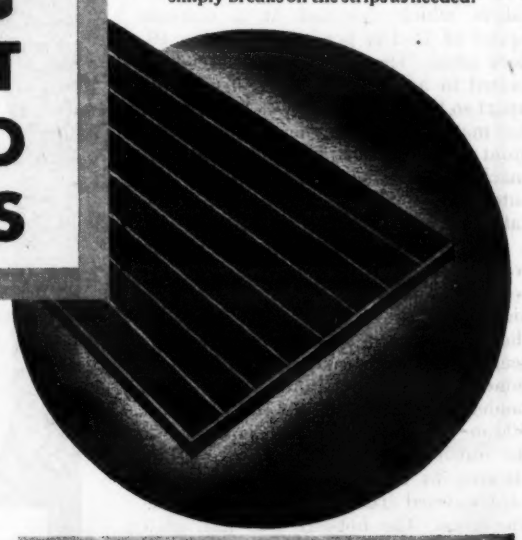
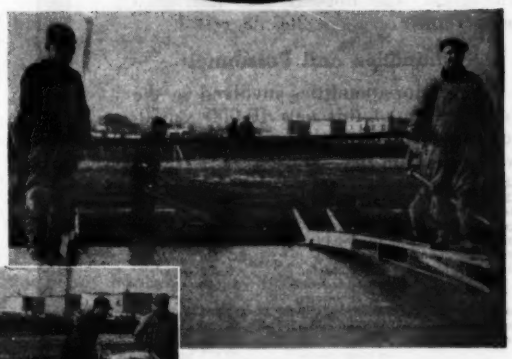
Keystone
ASPHALT
MASTIC BOARD
DUMMY JOINTS

Quick and easy to handle—it's ⅛" thick and furnished in full size sheets scored to the required width—one simply breaks off the strips as needed.



True and straight alignment obtained without expensive installing machinery.

This new, practical, ready-to-ship paving joint material, tested and proved by leading engineers "on-the-job" under all kinds of conditions, can be used transversally or longitudinally. Its low cost, ease of handling, absolute waterproofness and maximum rigidity make it the material to use where "weakened plane" type construction joints are required.



THREE EASY STEPS...

These photographs show the three easy steps to installing Keystone Dummy Joint—no expensive equipment is needed—yet alignment is straight and true.

1. Using a bridge over the wet concrete, the strip is carried out for this longitudinal installation. (Transverse contraction joints are installed the same way.)

2. Then the strip is placed in a simple steel installing channel. The men, kneeling on the bridge, press both joint and channel into the wet concrete — there's no difficulty keeping accurate alignment.

3. The joint, completely imbedded in the concrete, the steel channel is withdrawn, leaving the Dummy Strip intact. As fast as concrete is poured, the progress is repeated.

PAVING PRODUCTS..

Catalog with detailed description of all Keystone Products sent on request. Write Department K.

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MANUFACTURING PLANT • CHICAGO HEIGHTS, ILL.

PREMOULDED ASPHALT AND FIBRE EXPANSION JOINTS AND ACCESSORIES
JOINT SEALING COMPOUNDS AND CRACK FILLERS

Runway 2 Miles Long Is Paved with Hot-Mix

(*Continued from page 17*)

Passing	Binder Course Per Cent	Wearing Course Per Cent
¾-inch	90-100	90-100
½-inch	70-80	84-94
⅜-inch	58-68	77-87
No. 4	40-50	60-70
No. 10	26-34	43-52
No. 40	14-22	26-34
No. 80	8-16	14-22
No. 200	3-6	4-8

The specifications for the screen sizes of the slag were 15-100 per cent passing a ¾-inch screen and 0-5 per cent passing a No. 10 screen. The Ojus lime rock was required to have 90-100 per cent pass a ⅜-inch screen and 7-12 per cent pass a 200-mesh screen. The asphalt content of the mix was 7-8 per cent for the binder and 8-9 per cent for the wearing course.

The production of the 150-ton Simplicity System asphalt plant ran between 138 and 150 tons per hour, with the average over the job running 145 tons.

The Asphaltic-Concrete Paving

The asphaltic-concrete, hot-mix, paving was laid in two 1½-inch courses of binder and wearing course. A fleet averaging 8 trucks and with a maximum of 15, each hauling two 3-ton batches of the hot-mix, was used to supply the two Barber-Greene tamping-leveling-finishers which operated at a uniform speed of 16 feet per minute laying 10-foot lanes. The two machines were operated in adjacent lanes one truck-load apart so that the asphalt was laid against hot material, making the running of the joint much easier. The crew for each machine consisted of an operator, one lute man, one screed man, and two laborers.

The spreading of the asphalt paving was started at the center lanes and worked toward the shoulder on each side. As soon as a sufficient length of the hot-mix had been spread, it was sealed, or the breakdown rolling was done, by an 8-ton Buffalo-Springfield tandem roller immediately followed by a 10-ton Buffalo-Springfield tandem for the finish rolling. To prevent the rolls sticking to the hot asphalt they were kept watered from tanks carried on the machines. The hot-mix was laid at a temperature of about 260 degrees F.

Quantities and Personnel

The major quantities involved in the construction of this new 10,000 x 500-foot runway and taxiway improvements were as follows:

Clearing and grubbing	156 acres
Clearing	69 acres
Drainage	6,170 lin. ft.
Excavation	1,014,000 cu. yds.
Stabilizing subgrade, material	73,265 cu. yds.
Stabilizing, processing	827,456 sq. yds.
Lime-rock base, 6-inch compacted	5,450 sq. yds.
" " " 8-inch compacted	622,600 sq. yds.
" " " 4-inch compacted	34,450 sq. yds.
Base primed, 4, 6, 8-inch	622,500 sq. yds.
Concrete pavement, turn-arounds	51,870 sq. yds.
Asphalt pavement, binder	49,125 tons
" " wearing course	49,475 tons
(exclusive of dispersal taxiways)	

The work on this single long instrument runway was divided into two contracts. The contract for the grading, drainage and grassing was awarded to H. E. Wolfe Construction Co., while the stabilization, base, portland-cement concrete paving and asphaltic-concrete paving were awarded to Cone, Brinson & Manly, for whom Charles Cox was Superintendent. Manny Russ was General Superintendent, M. H. McCartney was Superintendent for Wesco Paving Co., subcontractor on the asphaltic-concrete paving, and D. L. McHugh was Superintendent for Wolfe. For the U. S. Engineer Department, under whose direction the work was done, Major Henry S. Brooks was Area Engineer.

Roads Should Pay Their Way

In order to fulfill the financial requirements of a continuing program of Federal-Aid, it must be reasonably certain that roads, when added to a planned system, will by service rendered to the general public be self-supporting. If they are not self supporting in terms of revenues obtained from gas taxes and other motor-vehicle imposts from the vehicles which use them directly, they will in fact be subsidized from revenues obtained through use of the heavily traveled arteries or from other general revenues. Thus all projects are considered as separate self-supporting projects. If they are subsidized, they should show other general utility benefits which make them desirable as feeders to more important roads.

—H. E. Hilts, Deputy Commissioner, Public Roads Administration.

Highway Official Honored By Florida Municipality

The city of Pensacola, Florida, has named the concrete bridge spanning the bay in honor of Thomas A. Johnson, in recognition of his many years of effort in effecting the elimination of bridge tolls on that structure. Mr. Johnson is Chairman of the Florida Road Department.

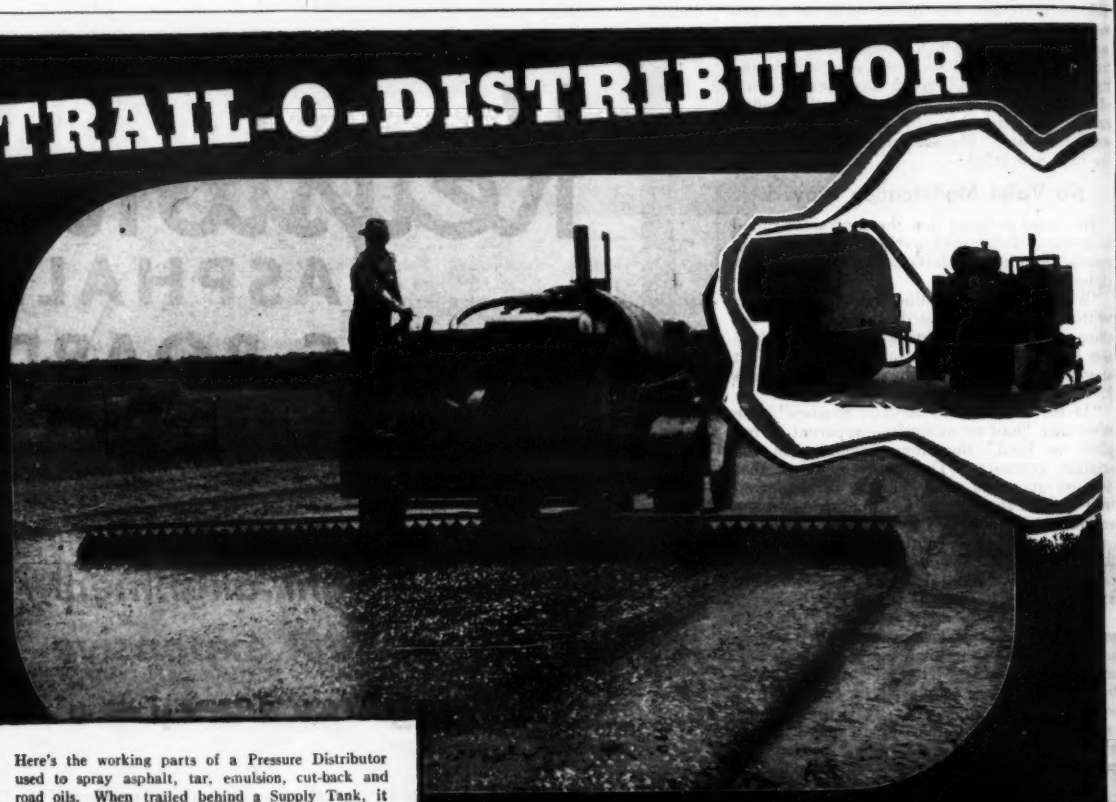
GEERPRES Mop Wringer

reduces mop costs from 25 to 50% over other methods of wringing—retains the mop fabric in a soft fluffy condition most desirable for rapid mopping. No more loose mop strings to catch around legs of desks and furniture when using GEERPRES.

New construction makes this wringer last for many years. Two popular sizes cover the entire commercial field. No. 1624 model will wring mops 14 to 24 oz. incl. No. 2436 model will accommodate mops 20 to 36 oz. incl. SEND FOR FREE CIRCULARS.

GEERPRES WRINGER, INC.
Manufacturers of High Grade Mopping Equipment
MUSKEGON, MICH.

TRAIL-O-DISTRIBUTOR



Here's the working parts of a Pressure Distributor used to spray asphalt, tar, emulsion, cut-back and road oils. When trailed behind a Supply Tank, it functions just like a Distributor.

When on long hauls from material supply to the job, a Trail-O-Distributor trailed behind a large Supply Tank is the most efficient method of spraying. Trail-O-Distributor is highly portable, mounted on a special running gear with elliptical springs, pneumatic tires, and adjustable for pulling tongue for hooking on Supply Tank.

If the Supply Tank has heating arrangement, the Trail-O-Distributor can be supplied with circulating arrangement which adds greatly to the heating of the material by agitating while hauling.

For a highly efficient spraying unit, the Trail-O-Distributor supplied by a Supply Tank is the most modern unit made today.

Littleford Bros., Inc.
485 E. Pearl St., Cincinnati 2, Ohio

LB LITTLEFORD
BLACK TOP ROAD MAINTENANCE EQUIPMENT
SINCE · 1900

What Should Be Told About Highway Plans?

Highway Departments Must Keep The Public Informed of Plans, But Announcement of Too Much Detail May Be Disadvantageous

By A. A. HOOPINGARNER, formerly with Ohio Department of Highways

IT has been demonstrated conclusively over a period of years that newspapers and magazines are interested in news about highway improvements. Thousands of clippings find their way into highway department offices month after month from newspapers, trade publications, automobile club magazines, and other media, indicating that where there is news there is adequate outlet for it.

With a receptive press and a receptive public, the only question which must be answered is what constitutes proper publicity to be released by state highway departments. Today, about all of the publicity which can be released and which has interest is on the post-war highway program. There should be no limitations placed on this publicity other than the one curb to insure proper protection for the public interest.

It is my considered opinion that it is unwise to publicize every minute detail involved in any post-war highway construction program until all rights-of-way have been obtained, until engineering studies are complete, and blueprints prepared. However, it is our conviction that Mr. and Mrs. John Q. Citizen believe in the integrity of any public official who has demonstrated, through years of hard work, that he keeps the public welfare uppermost in mind, and for this reason the public is not so much interested in the job of getting a highway project launched as it is in the finished product—the stretch of new and modern highway over which it is riding.

It is possible to sell a huge post-war program of highway building without impairing the public interest in the least, and this can be done through the medium of comprehensive newspaper stories.

The use of pictures, black and white drawings, photographs showing a project "before" the improvement is launched and a contour drawing showing what the betterment will look like when the work is completed, all lend themselves to sound publicity.

A picture frequently is worth many thousands of words of descriptive matter. Newspapers want pictures today despite the newsprint shortage. They will find space for them if they have news value and are pertinent to the interest of their readers.

Be Frank With the Public

In the Ohio Department of Highways it is felt that a policy of frankness—goods sold over the counter in plain view—is the only sure way to maintain public good will. This policy has been followed and it has paid dividends. There are objectors, of course,—there are always objectors. But usually they can be won over if the engineering studies of the highway department are laid-on the table as proof that the plan outlined is in the public interest, and that for the progress of the area to be served by the improvement such improvement should be carried out.

Take the public into your confidence. Automobile owners want good highways. They want to go places in the least possible time and at a minimum of cost and exertion. Good roads will keep them in good humor. That is true of the secondary roads also, the farm-to-market roads which the farmer has to use to transport his products to market.

Post-war highway planning is only a continuance of every-day normal-times planning, except perhaps that it is on a grander scale. Financing of much post-war highway improvement will have to be figured out later. No highway department has the cash in the till to launch a half-billion dollar betterment program. Here public good will comes very definitely into the picture.

John Citizen will want to know how the improvements are to be financed so, when the time comes to discuss financing, let him know the facts. We believe he will be found receptive and willing to help pay the cost if he believes in the honesty of his highway officials and the efficiency of his highway department. Sound publicity will prove to be the open door to public support. Always be sure the door is open.

Prepared from a paper presented before the Committee on Public Relations and Publicity of the American Association of State Highway Officials in Chicago, Ill., on December 2, 1943.

Thus far in this war, we have retaken only one-fifth of the land seized by the Germans, and one-twentieth of that taken by the Japs. Help bring Victory sooner by buying more War Bonds.

PUMPING PROBLEMS
. . . NEW HANDBOOK TELLS HOW TO SOLVE THEM!

IT'S FREE!

"The most valuable book of its kind!" is what engineers and contractors are calling the new Marlow Pumpbook. It describes the entire Marlow line . . . contains a large section of authoritative Engineering Data . . . tells how to solve pumping problems. Write for it; your copy will be mailed promptly.

MARLOW PUMPS
Makers of the World's Largest Line of Contractors' Pumps
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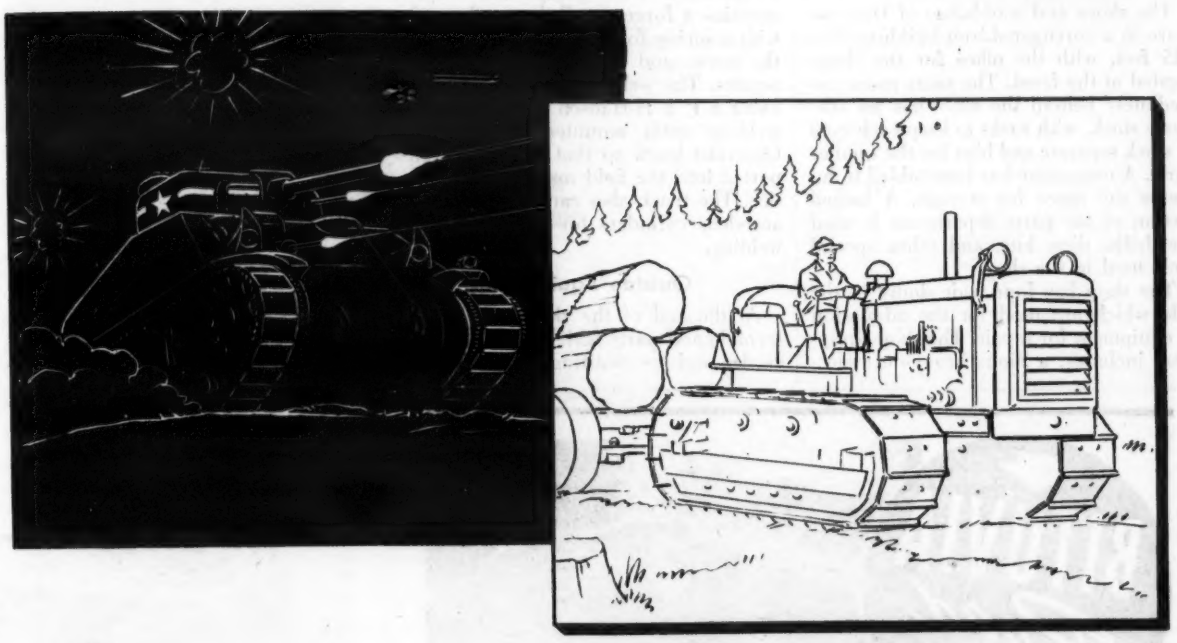

Warfare TO Welfare!

RODGERS EQUIPMENT is now doing yeoman service on our fighting fronts. Its duties vary from repair of embattled tanks to servicing equally vital crawler type tractors building roads, airfields, bridges and army camps.

We hope it will not be long before Rodgers Track Presses will be giving the same yeoman service to tractor equipment engaged in work here at home for human Welfare. We are looking forward to a tremendous construction development immediately after the war, and we wish to assure tractor owners and distributors everywhere that we will be ready to take care of their track press service requirements when that time comes. Rodgers Track Presses are available now on priority for essential construction jobs.

HYDRAULICS Rodgers KEEP THE WORLD MOVING

Manufacturers of:

UNIVERSAL HYDRAULIC PRESSES
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HYDRAULIC PLASTIC PRESSES
PORTABLE STRAIGHTENER FOR PIPE AND KELLYS

If it's a Rodgers, it's the best in Hydraulics. Rodgers Hydraulic Inc., St. Louis Park, Minneapolis 16, Minnesota.

Rodgers HYDRAULIC Inc.

Equipment Overhaul In Ala. Highway Dept.

Grove Hill Shops of Div. 6 With Division Offices, Surrounded by Well-Kept Lawn, Located Near Town

Part III

✦ IN Division 6 of the Alabama Highway Department the white-painted standard-brick Division office building is located adjacent to the Division shops on the edge of Grove Hill in southwestern Alabama, about 85 miles north of Mobile. Between the Division offices and the shops is a large graveled open storage yard where distributors, power graders, rollers, and other heavy equipment idle for the moment, or awaiting overhaul, are stored.

Parts Storage and Shops

The shops and warehouse of Division 6 are in a corrugated-iron building 45 x 125 feet, with the office for the shops located at the front. The parts room immediately behind the office has an adequate stock, with racks to keep each type of stock separate and bins for the smaller parts. A mezzanine has been added to increase the space for storage. A locked section of the parts department is used for drills, dies, bits, and other special tools used in the shop.

The shop has four wide doors in the side which are used for the admission of equipment for repair. The shop equipment includes: a Sioux heavy-duty electric hand drill, a Chicago brake-band riveter, a lock closet for the mechanics' personal tools, a long bench opposite the doors, a Sunnen reamer, another Sioux electric hand drill, a series of heavy vises for the mechanics, and drawers at intervals in the benches for storing tools and parts. The machine shop in the end of the building contains a heavy-duty drill, a portable acetylene welding outfit, a power grinder, a double A-frame with a 1-ton block, a power grinder, a garage compressor, a power hack saw, a buffer, a 24-inch x 5-foot lathe, a Rottler boring bar, a Black & Decker valve grinder, a Valley Electric Co. battery charger, and a Lempco hydraulic press.

Blacksmith and Welding Shops

The blacksmith shop is located in an open shed with a paved concrete floor at the back of the garage and shop. It contains a forge, anvil, heavy floor vise with a spring for forcing it open against the screw, and a fair stock of steel for repairs. The welder works in this shop, using a P & H-Hansen portable electric welding outfit mounted on a 1½-ton Chevrolet truck so that it can be transported into the field on a moment's notice. The truck also carries oxygen and acetylene cylinders for gas cutting and welding.

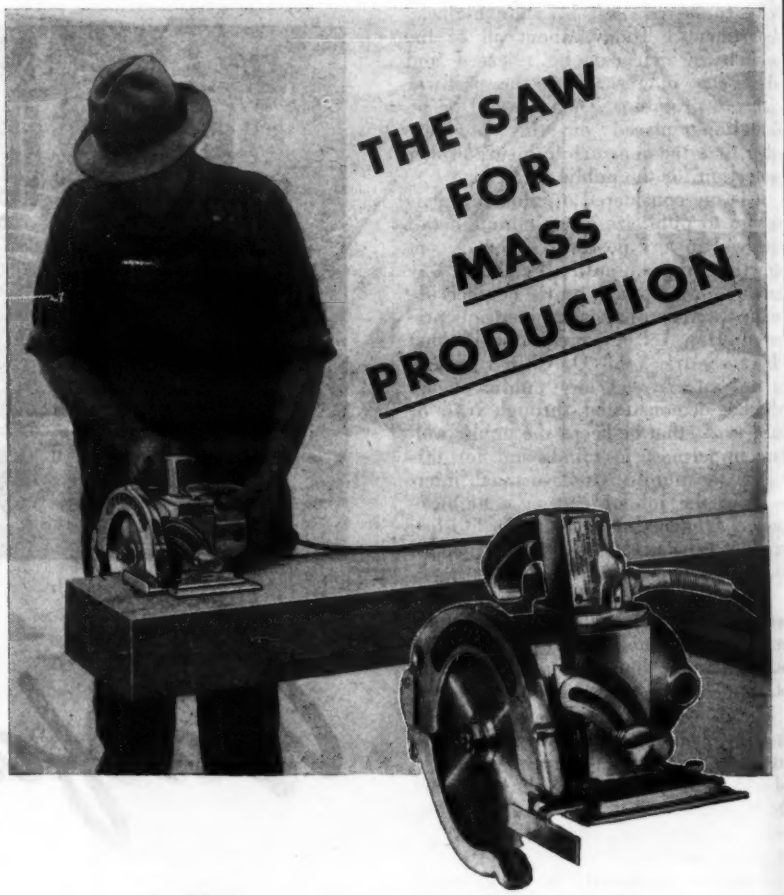
Outside Equipment

At the end of the shop is a bin for second-hand parts which have been discarded and are awaiting salvage. A two-pit wash and grease house has been built of corrugated iron and a drain from it leads to a gully close by. Back of the grease house is a paved floor with an old Cleaver steam booster unit which is used to supply steam for cleaning cars and trucks.

C. & E. M. Photo
The office of Division 6 of the Alabama Highway Department is located adjacent to the Division yards and shops.

Parked in the yard at the time of our visit to this shop was a novel gravel-loading machine built at the Division 6 shops. It consists of a heavy I-beam frame on two pairs of steel wheels carrying a set of Chain Belt buckets at the

(*Concluded on page* 54)



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built to take the IRK out of heavy work

Of course, Porter-Cable SPEEDMATICS, used in place of handsaws can do the usual run of jobs faster, more efficiently. But to realize the full possibilities of a SPEEDMATIC, plan the work so it will be kept cutting every minute of the day. You'll see the construction rate per man hit new highs when cutting is kept ahead of the time each piece is needed. You'll see, too, that SPEEDMATIC was designed to perform that kind of work—day-long cutting of 8 x 10's looks a lot easier with SPEEDMATIC.

SPEEDMATIC's inbuilt ruggedness comes from its oversize motor, and from the reliable helical gear drive that delivers 11% more usable power to the blade. The broad shoe sets it securely and safely, even when tilted to cut at an angle. Balanced grip makes it the only truly-one-hand saw. Available in 7½", 8", 10" and 12" sizes.

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DEMONSTRATION

Ask to see the SPEEDMATIC at work—then judge for yourself. There's no charge or obligation. Just phone your dealer or the local Porter-Cable representative (his name is in the classified 'phone book) or drop a postcard to us for full details.

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Whatever your problem in road or airport construction or maintenance, there is an economical and dependable way of solving it by the use of BITUVIA. An engineer from our nearest office will be glad to call and discuss your road problems.

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SEVENTEEN PLANTS TO SERVE YOU

Future Highway Work Planned in Minnesota

(*Continued from page* 1)

in four, eight and twelve months.

Plans for approximately $20,000,000 of work, including right-of-way, were under preparation or completed in the normal course of operation of the Department before the post-war planning program with Federal-Aid was begun, and much of the work provided for was included in the $36,000,000 program. To insure equitable distribution, both geographically and by classes of work, many jobs on which plans were substantially complete were not included in the one-year planning program.

A Quick Get-Away

Ordinarily Minnesota would plan for this amount of construction to be placed under contract over a period of three years but it is now being planned for letting during any one twelve-month period immediately following the cessation of hostilities. For the purpose of expediting scheduled completions, it is pretended that the time is at hand and the plans are being produced for immediate use, approval of the Public Roads Administration secured, and right-of-way acquired. When and if the $3,000,000,000 grant for post-war highway construction is made, Minnesota will be ready.

Planning Funds Provided

Under present laws there exist unallocated Federal-Aid balances of $1,379,000 for surveys and plans on the primary and secondary system of highways, plus an additional $270,000 for engineering investigations and economic studies for urban routings, principally in the metropolitan areas of the state's largest cities. As these sums must be matched on a 50-50 basis, the amount available is thus doubled.

A part of this money has been apportioned to the Statewide Planning Survey for use in making additional traffic counts and other economic investigations. Minnesota is in the fortunate position of having authorized and completed traffic-origin and destination surveys in the period prior to the war, supplementing the regular Federal-sponsored state highway planning surveys, and these will be of more practical value for intelligent planning than any similar studies which are possible today under the unusual conditions of wartime concentration of industry and its non-representative effect on the present traffic pattern. These surveys will be augmented and expanded during the post-war planning program and it is felt that post-war construction can be planned with a proper understanding of traffic problems which will exist in the future.

Man-Power Problem

The shortage of technically trained man-power which has inconvenienced other states in their post-war planning programs has not been absent in Minnesota. Between 400 and 500 men, principally in the lower grades, have left the Minnesota Department of Highways since the war started, most of them going to the armed forces but some accepting other employment. In the face of the ambitious program undertaken, it has been necessary to make some concessions to this condition in scheduling the work. Use is being made of both county and city engineering forces in making surveys for work in their localities and much progress has been made in the field work and economic studies for urban construction although the preparation of complete plans has been somewhat deferred. As the winter weather forced more and more field parties to cease operations for the season, these men were established in branch planning offices in the eight districts of the state where they could take over the preparation of highway plans, specifications, and contract documents, under the direction of the central office, while the central-office personnel devoted most of their time, after the work on rural highways was shifted to the districts, to the preparation of detailed plans for urban routes which had so far been partly postponed. There are now approximately twenty-five survey parties, averaging eight men each, doing field work, and twenty of these were shifted to district planning offices during the winter, while five remained in the field for investigations which had to be completed regardless of weather.

The 165 men now employed in the central drafting room handle all design, right-of-way maps, statistical charts and maps, and work of a similar nature. On Dec. 31, 1943, plans were completed for work distributed as shown in the accompanying table.

Personnel

This ambitious post-war planning program of the Minnesota Department of Highways is under the direction of M. J. Hoffmann, Commissioner of Highways, and O. L. Kipp, Assistant Commissioner and Chief Engineer, with E. J. Miller, Bridge Engineer, and G. G. Gladman, Engineer of Plans and Surveys, in direct charge of the work, aided by Walter Schultz, Assistant Engineer of Plans and Surveys.

Minnesota Status of Plans Summary, December 31, 1943

ONE-YEAR PLANNING PROGRAM (RURAL)

Type of Work	Miles in Program	Plans Completed Total Miles	Plans Being Designed—Total Miles	Prorated No. Miles Completed of Plans Being Designed	Grand Total
Grading	867.3	428.3	264.3	119.8	548.1
Paving	275.6	57.3	85.1	44.2	101.5
Stabilized Base & Bit. Surf. Treat.	473.5	120.2	0	0	120.2
Bit. Wearing Surface	53.2	8.6	0	0	8.6
Shoulder Grading & Pav. Widen.	187.8	10.8	15.3	2.7	13.5
	No. in Program	No. Completed	No. Being Designed	Prorated No. Bridges Completed of Number Being Designed	
Bridges	117	29	21	7	36

Portable Electric Plants and Generators

A comprehensive catalog on its portable electric plants is available from the Wind Power Mfg. Co., Newton, Iowa. These plants, in both alternating and direct-current models, range in capacity from 350 to 25,000 watts. The totally enclosed generator, spark plug and ignition system permit operation in all kinds of weather, and the plants come equipped with convenient carrying handle or dolly-mounted for use on construction jobs.

Highway engineers and contractors may secure copies of this catalog direct from the manufacturer by mentioning this item.

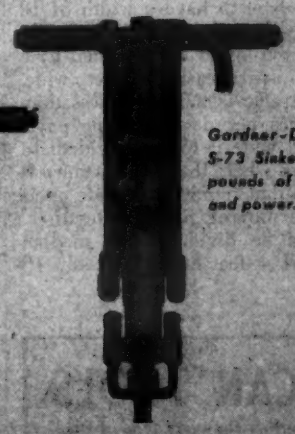
NOBODY LIKES ROUGH RIDING

WHO likes rough riding on a construction job—nobody! The men can't do their best work with rough-riding rock drills—and contractors can't make satisfactory progress under such conditions.

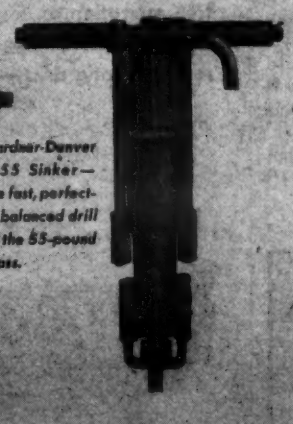
Gardner-Denver Sinkers are *popular* drills because they are especially designed for easy riding and balanced performance. And because they permit more footage per shift, they're preferred by contractors, and quarry operators too!

Noted for their powerful four-pawl rotation—for their thorough hole cleaning—and for their low air consumption—Gardner-Denver Sinkers can increase output on your workings. For full information, write Gardner-Denver Company, Quincy, Illinois.

Gardner-Denver S-79 Sinker—an exceptionally powerful drill of the 80-pound class.

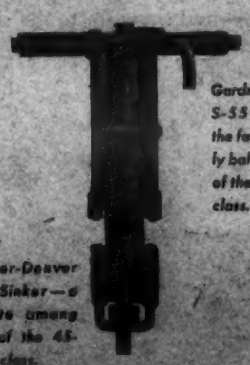


Gardner-Denver S-73 Sinker—67 pounds of speed and power.



Gardner-Denver S-55 Sinker—the fast, perfectly balanced drill of the 55-pound class.

Gardner-Denver S-33 Sinker—an outstanding performer for its weight class.



Gardner-Denver S-45 Sinker—a favorite among users of the 45-pound class.

GARDNER-DENVER

Since 1859

Interregional-System Standards of Design

(*Continued from page 2*)

difficult terrain, the speed should be not less than 55 miles and 35 miles per hour respectively. It is further prescribed that in rural sections there shall be a sufficient number of traffic lanes and other facilities so that at no time, except during infrequent peak hours, will the speeds be reduced to less than 50 miles per hour because of the interference of other vehicles.

In urban sections the design is to permit speeds of 50 miles per hour by passenger cars and not less than 35 miles an hour by trucks and tractor combinations, with a sufficient number of lanes and other facilities to permit an average running speed of not less than 40 miles per hour, except under infrequent peak traffic conditions.

Design Standards

A 28-page appendix to the Committee's report is devoted to basic standards for rural and urban sections of the Interregional System. These basic standards are generalities rather than blueprints but are all keyed to the foremost planning now used in the design of American highways.

On rural sections the system is to be established as a limited-access highway, with as direct location as possible between control points, and conforming to the topography to avoid the appearance of a forced alignment. Four or more traffic lanes are to be constructed, two distinct one-way roads should be provided, rather than a divided highway of fixed cross-section, wherever advantages of alignment, construction cost, or traffic facility may be expected to result from such provision. Horizontal curvature is suggested to be a maximum of 2.5 with an absolute maximum of 3 degrees for speeds of 75 miles an hour, with a lower degree of curvature when it is necessary to meet sight-distance requirements. Super-elevation is to be used on all curves sharper than 1 degree, at the rate 0.12 foot per foot as a maximum, and not more than 0.08 foot per foot where snow and ice may be expected to cause a frequent slippery condition. Nonpassing sight distances for 75 miles an hour are to be a minimum of 800 feet, with 400 feet for sections where the speed is limited to 50 miles per hour. The minimum sight distances for permitting passing at design speeds of 65 to 75 miles an hour is 2,600 feet.

The Committee suggests two lanes for rural sections carrying an average daily traffic of 3,000 but less than 15,000 vehicles, each lane to have a width of 12 feet and the lanes for traffic moving in opposite directions to be separated by a median strip at least 15 feet wide. Where the traffic is 2,000 but less than 3,000 vehicles per day, a 2-lane pavement 24 feet wide is to be provided. In those sections where the sight distance is not equal to that required for safe operation, traffic moving in opposite directions should be divided by a median strip at least 4 feet and preferably 15 feet wide.

Shoulders are to be 10 feet wide, except in mountainous topography where the expense of a 10-foot width would make it undesirable, and where two roadways of a divided highway are widely separated or constructed at different elevations, in which case left shoulders may be less than 10 feet, but in no case is the shoulder width to be less than 4 feet. In excavation, gutters and ditches are to have slopes from the edge of the shoulders not steeper than 1 foot vertically to 4 feet horizontally. Side slopes in excavation, except in solid rock, are to have a slope not steeper than 1 foot vertically to 2 feet horizontally, modified as desirable to meet landscape requirements. Sides of all excavations are to be rounded at the top and bottom to merge by curves of natural appearance into the slopes of the adjoining land and those of the gutter or ditch.

The sides of all embankments 10 feet or less in height are to have a slope not steeper than 1 foot vertically to 4 feet horizontally except where the adjoining

(*Continued on next page*)

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Use this CONNERY oil-burning Patrol Patching Heater on the *small* job and this CONNERY oil-burning kettle for *large-quantity* production.

Write for catalog showing our full line of tar and asphalt heating kettles, spraying attachments, pouring pots, etc.

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NOW is the time to select equipment for next winter's snow removal!

SNOW removal may occupy only four or five months of your year. But snow removal *planning* is a year round job! Remember — the specialized equipment needed for highway snow clearance cannot be evaluated, ordered and manufactured on short notice.

When you're considering additions to your snow removal fleet, study the outstanding records for snow-free operation on highways patrolled by Walter Snow Fighters. These rugged, powerful units smash through road-blocking drifts—hurl snow far to the side—speed widening-out — prove more than a match for any blizzard!

This high speed, traction and volume snow removal is made possible by Walter Four-Point Positive Drive. Power is proportioned to each of the FOUR driving wheels according to its traction at any instant. There is none of the wheel-spinning, slipping and stalling that result from wasted power in rear-wheel and conventional four-wheel drive trucks. Your first step toward more efficient snow removal next winter, is to get the facts on Walter Snow Fighters, *today!*

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Design of Structures On Routes of Future

(*Continued from preceding page*)

land lies on a steeper downward slope or where landscape conditions may justify modification. All embankments not more than 10 feet in height and those built on ground having a natural downward slope steeper than 1 foot vertically to 4 horizontally are to have slopes not steeper than 1 foot vertically to 2 feet horizontally.

Grades in the rural sections vary according to the traffic. Where the average daily traffic is less than 1,000, the maximum desirable grade is 3 per cent for relatively level country, 4 per cent in rolling country, and 6 per cent in mountainous. At the other end of the scale, where the traffic is more than 5,000, the three figures respectively are 3, 4 and 5 per cent.

In order to conform with the right-of-way requirements, it will be necessary to obtain public control over a strip of land not less than 224 feet wide in the case of the most lightly traveled sections of the system to be improved initially with two-lane surfaces or pavements, and not less than 288 feet in all other cases.

Suitable foundations are to be provided to support the pavement necessary to carry the recommended maximum loads of vehicles. It is interesting that shoulders are to contrast in texture and preferably in color with the adjoining surface or pavements and are to be capable of supporting the recommended maximum loads of vehicles standing on them or passing on to them infrequently and in emergency at high speed.

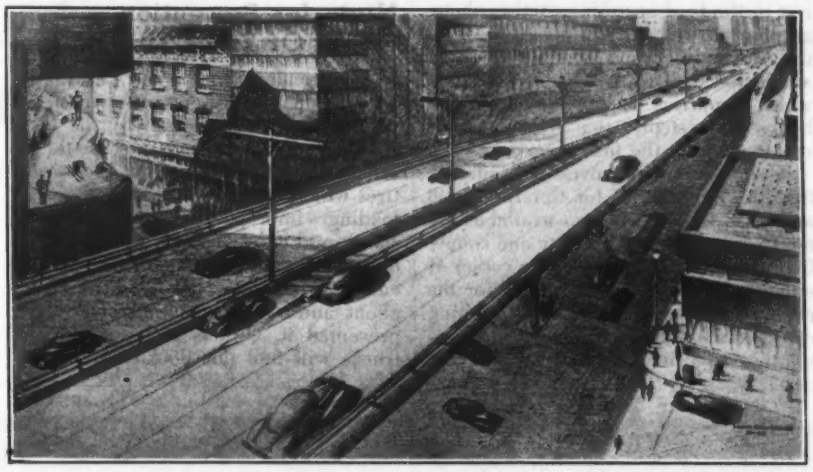
Structure Design

Bridges are defined as structures longer than 20 feet, measured between abutments, and are referred to as long bridges if more than 100 feet in length, and short bridges if less than 100 feet in length. Structures less than 20 feet between abutments are referred to as culverts. Bridges are to be at least 6 feet wider than the surface or pavement of the approach highway, and are to provide a sidewalk at least 18 inches wide in the case of long bridges. On short bridges, the lateral distance from the edge of the pavement of the approach highway to the face of the bridge rail is not to be less than the width of the shoulder on the approach highway.

The clear height of all bridges over the entire width between the outer curbs is to be not less than 14 feet, while the openings under bridges for railways are to be determined by agreement with the railway companies concerned. Beneath any bridge carrying one highway over another there is to be a clear space of not less than 14 feet and not less than 12½ feet above the outer edges of the shoulders.

Pavements on bridges are to be of the same color as the pavement on the approach highways and the bridge pavement outside of the width of the approach highway is to approximate the color of the shoulders of the highways.

All bridges on the rural sections of the Interregional Highway System are to be of steel or reinforced concrete, designed for the standard H20-S16 design loadings specified by the American Association of State Highway Officials. All short bridges are to be of deck construction and long bridges preferably of the same type of construction.



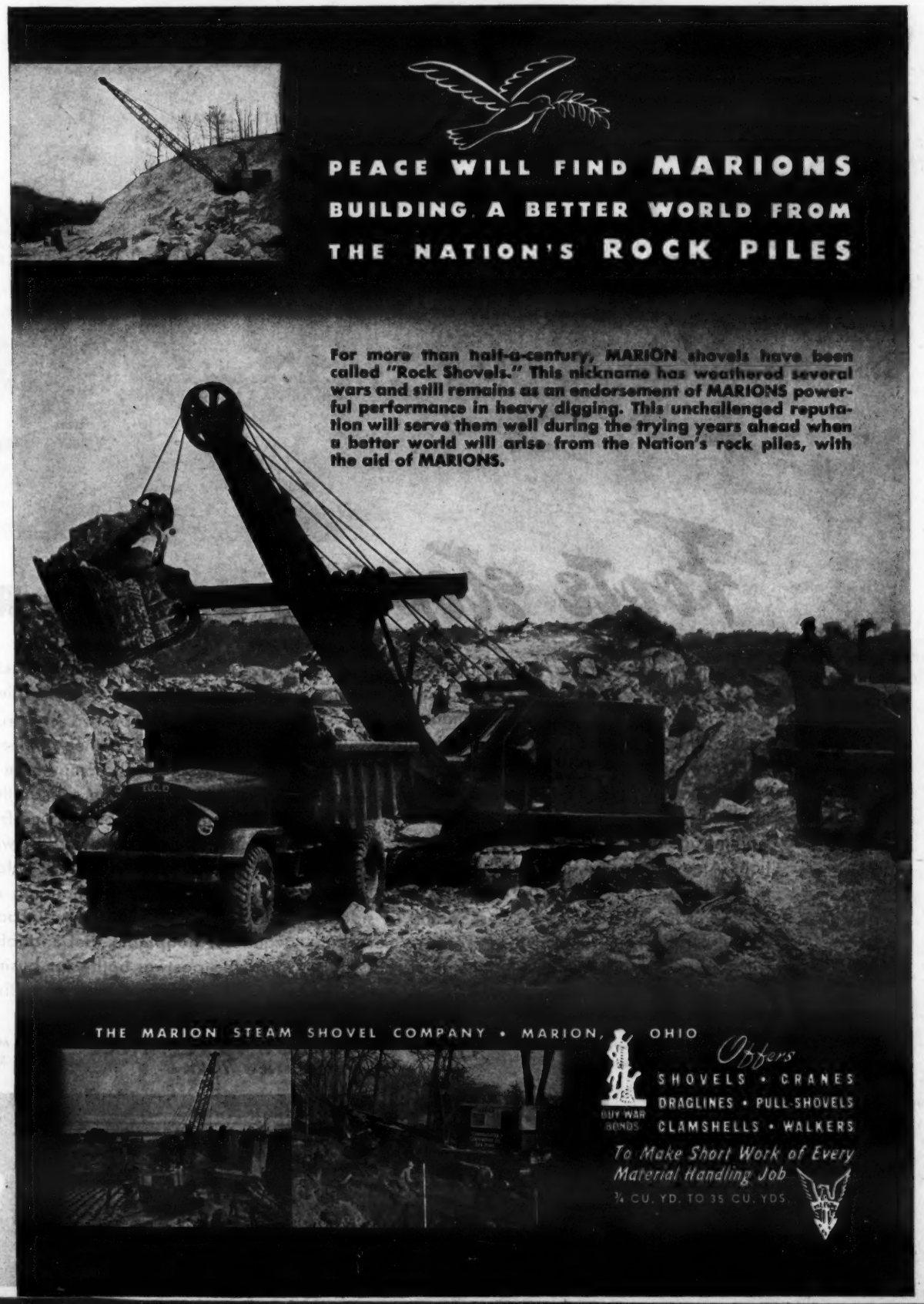
An elevated section of the Interregional Highway System as it might be built in accordance with proposed standards, with central-exit and lateral-entrance ramps.

Underpasses on rural sections of the system are to provide a width for the passage of the Interregional Highway equal to the sum of the widths of the surfaces or pavements, median strip and shoulders as the highway approaches the underpass. This width is to be clear of all obstruction except that a central pier of an underpass structure may be placed within the median strip of the divided highway. The clear heights of underpasses are to be the same as those for bridges over highways.

Tunnels are to accomodate, if financially feasible, the same number and width of traffic lanes as provided on the highway approaching the tunnel. Tunnels on two-lane highways should provide space for a 2-foot flush median strip between the two lanes and have an overall width not less than 10 feet greater than the pavement or surface width of the highway approaching the tunnel, to provide for the 2-foot center separation and not less than 4-foot side clearances beyond the edges of the pavement.

Adequate pedestrian paths are to be

(*Continued on page 64*)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Maintenance Manuals For MobiLoader Units

An Operating and Maintenance Manual for users of Athey MobiLoader Models 4-1 and W4-1, operated with Caterpillar D4 and R4 tractors, has been prepared by the Athey Truss Wheel Co., 5631 W. 65th St., Chicago 38, Ill. One of the series of War Department manuals on equipment care and operation, this booklet is a complete guide to the proper operation of MobiLoaders, describing their construction and characteristics, directions for installation, inspection and adjustment procedure, and the correct methods of operating. Action photographs, as well as sectional photos of the MobiLoader and component parts, are included. The maintenance section, which comprises the greater part of the book, gives step-by-step directions for repair work in the field.

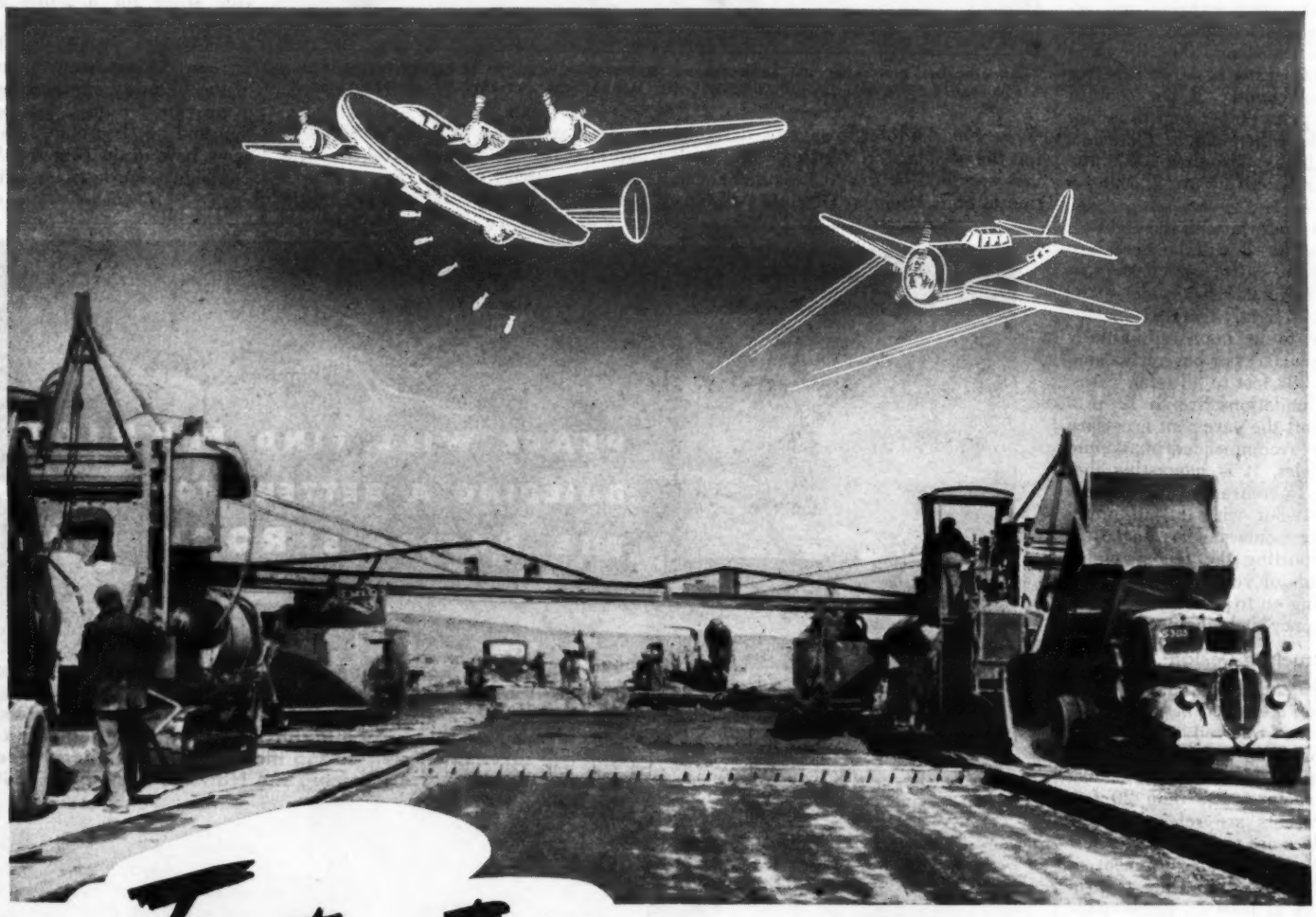
A similar manual covering Models 8, 8H, 8M, 8C and 8B, for Caterpillar D8 and RD8 tractors, is also available. Interested contractors and state and county highway engineers may secure copies of either or both of these manuals for the care of their MobiLoaders by writing direct to the manufacturer and mentioning this magazine.

Hints for Prevention Of Truck-Tire Failure

A particularly timely and informative booklet on the prevention of truck-tire injuries has been released by the B. F. Goodrich Co. It presents a series of excellent photographs showing sections of tires which have been damaged by overloading, improper inflation, excessive speed, and careless or reckless truck operation, and the accompanying text discusses briefly how the condition came about and what precaution could have prevented it. Owners and operators of trucks will find this booklet of interest both from the point of view of saving tire costs and conserving critical material important to the war effort.

Copies of this booklet, as well as details of a point-by-point conservation program inaugurated by the B. F. Goodrich Co., will be sent upon application to that company at Akron, Ohio. Just refer to this review.

According to a report presented at the National Safety Congress, the construction industry spent, on an average, 97 cents per capita for safety equipment during 1942. The average of all manufacturing industries surveyed was $3.80.



Foote steps to a Paving Record

Under the urgency of war, Multi Foote Pavers, leaders in peacetime production, are setting new records for high speed paving, for rugged dependability, and for cooperation. Recently on a rush job in the Nevada Desert two contractors teamed up a pair of 34E Multi Foote Pavers to pour a record of 111,406 cu. yds. of 9 in. slab in a period of 27 days—ahead of schedule, working against sand, wind, cold, and other tough conditions. An average of 4,000 cu. yds. per day was maintained. In one 24-hr. period, 6,890 cu. yds. were placed!

Part of the time the pavers worked side by side as shown. At other times they were separated by more than a mile, pouring at intersections, turning points, and spots provided for warming up. Adaptability and cooperation got the job done. Contractors were J. A. Carson Co. and N. M. Ball Sons. The field was being rebuilt to speed up training of Air Force bombardiers and gunners.

In planning for postwar construction, consider the importance of selecting equipment now that will enable you to meet all competition — that will not be obsolete after the firing ceases, that will provide big production, dependable service free of excessive repair charges and delays, that will show low costs. Multi Foote Pavers led the field before the war. Multi Foote Pavers are hanging up new records in rush construction now. Multi Foote Pavers will be available, adaptable, dependable and economical when the postwar battle for business begins. Make sure you stay competitive by getting the Paver which is still setting records.

The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers.

THE FOOTE COMPANY, INC.
NUNDA • NEW YORK

Multi Foote Pavers Conform to A. G. C. Standards and Specifications.

ARMY E NAVY

MULTI FOOTE CONCRETE PAVERS

ADNUN BLACK TOP PAVER

Paving At Airfield On Unusual Subgrade

Unstable Sand and Muck Stabilized by Subsurface Drainage; 34-E Pavers Used On Runways, Taxiways, Apron

✦ PAVING at Brookley Field, Ala., has been carried on continuously but not in as large contracts as at large training fields. Its construction was started before the war to provide a repair depot for planes in the southeast and overseas, but its purpose has since been changed to serve only the southeastern section of the country. The high water table and unstable subgrade in this area created some interesting conditions. Test pits 3 feet deep showed water at that depth which quickly rose to within 18 inches of the surface. Borings showed sand varying in thickness from 2½ feet to 10 feet underlaid by a blue clay that is impervious to water. The field is an average of 25 feet above river elevation so that subsurface drainage is entirely by gravity.

Drainage System

Drainage of the field is effected by a system of concrete pipes laid at depths up to 20 feet and in sizes from a minimum of 15-inch up to a double 60-inch. A single 66-inch concrete pipe also carries water from the apron area to provide additional drainage alongside a box culvert running to a natural drainage ditch. The 8 x 6-foot box culvert was one of the first drainage structures built at the field. When the initial drainage system was completed, the outfall ran a good stream of water, but now, even after heavy rains, there is only a small stream on the invert.

The 8 x 6-foot culvert was a great assistance in the completion of the drainage during the summer of 1943, when the apron was extended to 1,000 feet long and over 500 feet wide. The drainage did not have to start at the outfall end of the new 66-inch line because the old culvert could handle the water at that time. Thus it was possible to put in the drains under the apron area first and lay the 66-inch pipe from there to the outfall. This permitted much earlier paving of the apron than had there been no supplementary drainage available.

Subgrade Treatment

The practice at Brookley Field has been to stabilize the sand subgrade for a depth of 6 inches by windrowing the top and adding sufficient gravel to give the required strength. This was mixed by blades and has formed an adequate foundation for the runways, taxiways, and aprons. It is interesting to note, however, that there is no base under the 10-inch concrete apron laid during the summer of 1943, in spite of the fact that earlier construction of this type at the field has the subgrade treatment beneath all paving. If this apron had been constructed a year before, it too would have had the subgrade stabilized with gravel before paving started. But the gravity drainage system has proved so effective that it has lowered the water table over the entire field and thus stabilized the sand sufficiently so that its bearing capacity has been greatly increased.

Fine Grading and Forms

For the fine grading just ahead of the setting of the forms, the contractor used a Caterpillar D8 with a Model L LeTourneau scraper. During the wettest weather in the spring, before the drainage system was complete, the ground was in such a poor condition that it was necessary at one time to use five tractors to pull one scraper out of the mud. The grade was cut by a Caterpillar No. 112 before the forms were set, and after they had been set to grade and line, a Caterpillar D6 pulled a Hug subgrader over the forms to cut the grade true for the 10-inch uniform slab. The subgrade was rolled to smoothness and firmness by a 5-ton Buffalo-Springfield 3-wheel gas roller.

A crew of five men was used to set and line up the 8-inch forms, which were built up with 2 x 10's to give 10 inches in height and added base to insure sufficient bearing to handle the heavy subgrader and then the finishing machine. The contractor provided one of the laborers with a pick, to the end of one point of which had been welded a block of iron, to use to pack the earth under the base of the forms on the inside, further to insure the stability of the line. Every fourth lane of concrete in the apron had a longitudinal expansion joint ¾ inch thick. The other edges were all keyed by placing a strip of wood on the forms to make the key.

Completing the Apron

The expansion joints were set 100 feet apart and the dummy joints 25 feet between on the aprons and 75 and 25 feet on the runways. The ¾-inch expansion-joint material carried 1-inch round dowels 16 inches long spaced 12 inches on centers for transverse load transfer. Also, this contract returned to the earlier practice, current when steel was not so critical, of placing tie bars across the center joint. The dummy and center joints were cut ¼ inch wide and 2½ inches deep, and beneath the center joint at mid-height of the slab ⅝-inch deformed bars 30 inches long spaced 30 inches apart were set in stamped metal pins.

The Nelson setting device for the expansion-joint material held the joint straight and true until lifted from the forms. The two angles welded back to back and slung just low enough to permit the finishing machine to run over the joint is an important feature, aiding the rapid completion of the finishing over a slab.

The expansion joints, set ¾ inch low, and the dummy and center joints were all cleaned with a sharp pick before being poured, after the slab had cured for two or three days. A small Gardner-Denver air compressor was used to blow out the joints to remove any dust just before the pouring was started. The asphalt joint filler was heated in a Standard Steel Works kettle and poured with two conical pots.

The contractor ran the paver in the adjacent 25-foot lane to permit the rapid setting of the expansion joints ahead. For a period he used two new 34-E Koehring TwinBatch pavers, but the lack of available 2-batch trucks in the vicinity made it necessary to hold one of the pavers in reserve and use only one at a time on the paving. With but one, he was able to maintain a uniform production of

(*Concluded on page 73*)

HERE'S A Conversion

To Boost Production *Today*
To Cut "*Changeover*" Costs *Tomorrow*

Boost production today with a new Climax engine drive, and get more work out of old but serviceable machinery.

For stationary work you can make substantial operating economies through the higher efficiencies, valuable heat recoveries and negligible maintenance costs obtained from the new engine.

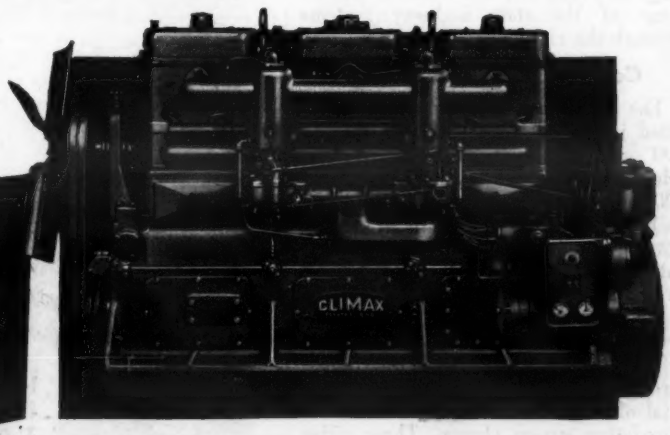
For portable service a new Climax engine brings you the benefits of lighter weight, easier handling, greater operating flexibility, and reduced operating costs.

You can "changeover" economically with a Climax engine and put your machinery in top shape for postwar work.

If you are planning new equipment, the "tailored" advantages of these engines are a solution to many machine design problems. Whenever needed, Climax power plants may be individually designed, rated and equipped to meet specific needs.

Climax Engines are 4, 6, 8 and 12 cylinder gas engines with ratings from 8 to 495 hp. Climax Diesel engines are made in two models rated at 22 and 44 hp. The gas engines operate on natural gas, butane, gasoline, distillate or other fuels. The Diesels use low grade fuel oil.

Climax Generating Sets consist of a Climax engine directly connected to an AC or DC generator, and are available in over 100 sizes from 300 watt to 312 KVA.



"For High Achievement in the Production of War Material".

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GENERAL OFFICES & FACTORY:
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REGIONAL OFFICES: CHICAGO, ILL., DALLAS, TEXAS

The Climax Model R6I valve-in-head Blue Streak engine above develops 180 hp. at 1200 r.p.m., and is designed for operation on natural gas, manufactured gas, butane, sewage gas, gasoline or other fuels.

Needed Road Work In Next Five Years

Group of ARBA Post-War Highway Committee Reports Encouraging Figures of Potential Activity

✦ OVER $16,500,000,000 of highway work could be handled and justified in the United States in the next five years, according to replies from state highway departments, and counties and cities of over 10,000 population received by the Subcommittee on Needed Work of the American Road Builders' Association Post-War Highway Committee. The report, presented by Hal G. Sours, Ohio, Director of Highways, as Chairman, and Gen. James A. Anderson, Commissioner of Highways of Virginia; Otto S. Hess, Engineer-Manager, Kent County Road Commission, Grand Rapids, Mich.; and Raleigh W. Gamble, Superintendent of Street Construction and Repairs, Milwaukee, Wis., is based on replies from 42 states, 167 counties and 161 cities.

The total dollar volume of needed highway construction reported by these governmental units is:

42 states	$7,171,000,000
167 counties	733,000,000
161 cities	821,000,000
Total	$8,725,000,000

If these figures are considered as representative, they may be handled statistically to give an indication of the total highway needs of all the states, and the entire group of counties and cities over 10,000 population. This gives the following overall figures:

States	$7,500,000,000
Counties	4,000,000,000
Cities	5,000,000,000
Total	$16,500,000,000

Are Plans Progressing?

The replies to the questionnaire contained considerable information on the condition of planning and acquisition of right-of-way now and as of January, 1945. A total of 24 of the 42 states replying stated that plans and right-of-way were ready for $188,000,000 of highway construction. Twenty-five of the 42 states reported complete plans, with or without right-of-way, for $312,000,000 of construction, while 24 of the 42 stated that they would have plans and right-of-way as of January, 1945, for $967,000,000 of work. Thirty-three of the 42 provided a total of $1,397,000,000 as the value of construction they would be ready for, with and without right-of-way, as of January, 1945. The total plans for construction that will be ready in the offices of the 42 state highway departments in January, 1945, will amount to $1,900,000,000.

If these figures are converted proportionally for the 48 states, it would indicate that there should be a total of $2,000,000,000 of construction planned, with and without right-of-way, by January 1, 1945, and these include extensions of the state highway systems through the cities.

Counties and Cities Report

The 167 counties reporting were located in 27 different states. A total of 600 questionnaires was sent out to selected counties having more than 10,000 population, out of the total of 1,000 such counties. If the pattern of the reporting counties were applied to the entire 1,000 counties, the result is a probable total of $4,000,000,000 of highway construction which would be needed for the coming five years.

The cities reporting were distributed through 34 states and come from a total of slightly over 1,000 cities in the population group chosen. These cities showed plans complete for only a total of $57,000,000 of street work as of January, 1944, and a probable total of $289,000,000 by January, 1945.

There is a general realization that plans are needed in state, county and city highway groups, according to the Chairman of the committee, but lack of engineering personnel has been the bottleneck. The states are planning to overcome this in some measure by employing consulting engineering firms to design the larger bridges.

American Wire Fabrics Elects Weaver Vice Pres.

The Board of Directors of the American Wire Fabrics Corp., a subsidiary of the Wickwire Spencer Steel Co., recently elected B. L. Weaver Vice President in charge of operations at the Mt. Wolf Plant, Mt. Wolf, Pa. Mr. Weaver began his career in the steel industry with the Pennsylvania Steel Corp., and, following that company's amalgamation with the Bethlehem Steel Corp., he became associated with the latter company. For the past two years, he has served with the War Production Board as Chief of the Steel Casting Section.

PLAN YOUR HIGHWAY POSTWAR PROGRAM NOW
Include TUTHILL GUARD RAILS
in Your Specifications

SOUND planning, foresight, wise economy and seasoned judgment are combined when you specify in your Highway Postwar Program the well-known, widely used TUTHILL GUARD RAIL.

TUTHILL convex design and spring-like, deflective action, assure maximum safety, exceptional visability, attractive appearance, economical installation and low-cost maintenance.

Be sure to include the TUTHILL Guard Rail in your Postwar Plans for Highway Safety.

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War is the supreme test . . . of men and machines. 300,000 Dodge-built "Fighting Trucks" throughout the world and hundreds of thousands of Dodge *Job-Rated* trucks at home are piling up almost incredible records of high mileage and dependability. Everywhere, these quality-built trucks are establishing this important fact: "It's a long way to the last mile of a dependable Dodge."

DODGE Division of Chrysler Corporation

DODGE *Job-Rated* TRUCKS
FIT THE JOB... LAST LONGER

TUNE IN MAJOR BOWES, CBS THURSDAY, 9 P.M. E.W.T.

4,500,000 TRUCKS, AND THEIR MILLIONS OF DRIVERS, ARE SERVING AMERICA'S VITAL HOME FRONT!

Planned Public Works Must Include All Units Of Civil Government

The efforts on the part of the Federal government to obtain a balanced public works program through the normal peacetime construction agencies of the national government should be reinforced by similar efforts on the part of state and local governments, according to Harold D. Smith, Director, Federal Bureau of the Budget, in a paper presented at the 41st Annual Meeting of the American Road Builders' Association at Chicago, Ill., February 2, 1944, if we are to achieve that unity in our national public works policy which will contribute most to high employment and a healthy national economy.

Such unity would avoid a repetition of the condition which occurred during the depression when the Federal government increased its public works expenditures greatly, only to have this increase counterbalanced by a reduction of state and local expenditures for public works. It is believed that we can avoid such contradictory policies in the post-war period.

During the depression, curtailment of public works was forced on state and local governments by severe decline in revenue, unfavorable bond market conditions, and lack of reserves. Since the need for public works in many communities had been met in the building boom of the 1920's, it was possible to make these curtailments without immediate reduction of essential public services. Today the prospects are quite different. Not only have state and local governments accumulated needs and some specific plans for fulfilling those needs—they have also, in very large numbers, accumulated reserves of cash or credit with which to finance public works and other post-war adjustments.

During the war, leaders in state and local governments have recognized that the fiscal policies which they adopt have significance for national as well as local welfare—that the two are interrelated. The need for consistent fiscal action by Federal, state and local governments was emphasized in meetings and in policy statements before Pearl Harbor. It was widely agreed that state and local policies can help to control inflationary dangers, to foster war production, and to ease post-war readjustment. Specific suggestions were formulated for achieving consistent policy. This development is in striking and happy contrast with the policy contradictions of Federal, state and local governments during the depression.

In applying these fiscal policies, state and local governments as a group have restricted expenditures, maintained tax rates, paid off debts, and built up reserves. In three years, these governments have reduced their aggregate debt by more than $1,600,000,000 or about one-tenth. Along with some refunding at the low interest rates fostered by exemption from increased Federal income taxes, these debt retirements have enabled state and local governments to reduce annual interest payments by about $100,000,000 —more than one-eighth—in the same period. Their accumulated reserves for wartime emergency or post-war use are now probably in excess of $1,000,000,000 while at the same time their treasury working balances have generally increased. The state governments alone have invested more than $1,500,000,000 in Federal government bonds.

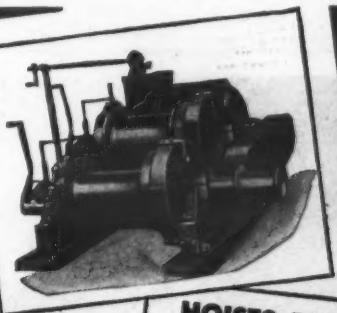
In considerable part, the payment of debt and accumulation of liquid assets by state and local governments has been merely an offset to undermaintenance of existing properties and deferment of new construction. The need for catching up on maintenance and new construction should directly affect the uses to which these reserves will be applied.

With these accumulated reserves or liquid assets or borrowing power available to finance useful public works and services, the state and local governments will be in a better position during the post-war readjustment than they were during the depression. They will be able to exercise greater control over the timing of their public works and so derive the maximum benefit from them.

LaPlant-Choate Now Has New York Office

Announcement has been made by the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa, manufacturer of earth-moving and land-clearing equipment, of the opening of a New York sales office, located in Suite 1157 of the International Bldg., Rockefeller Center, 630 Fifth Ave., New York City 20. The office will be in charge of Jay Fetters, recently on the staff of the Chief of U. S. Army Engineers. Mr. Fetters was at one time London Manager for the Caterpillar Tractor Co., and also represented that company in India, Burma, Afghanistan and Ceylon.

Hoists to Fit the Job



Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency *on the job*. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire *first* of LIDGERWOOD.

HOISTS FOR:
CABLEWAYS
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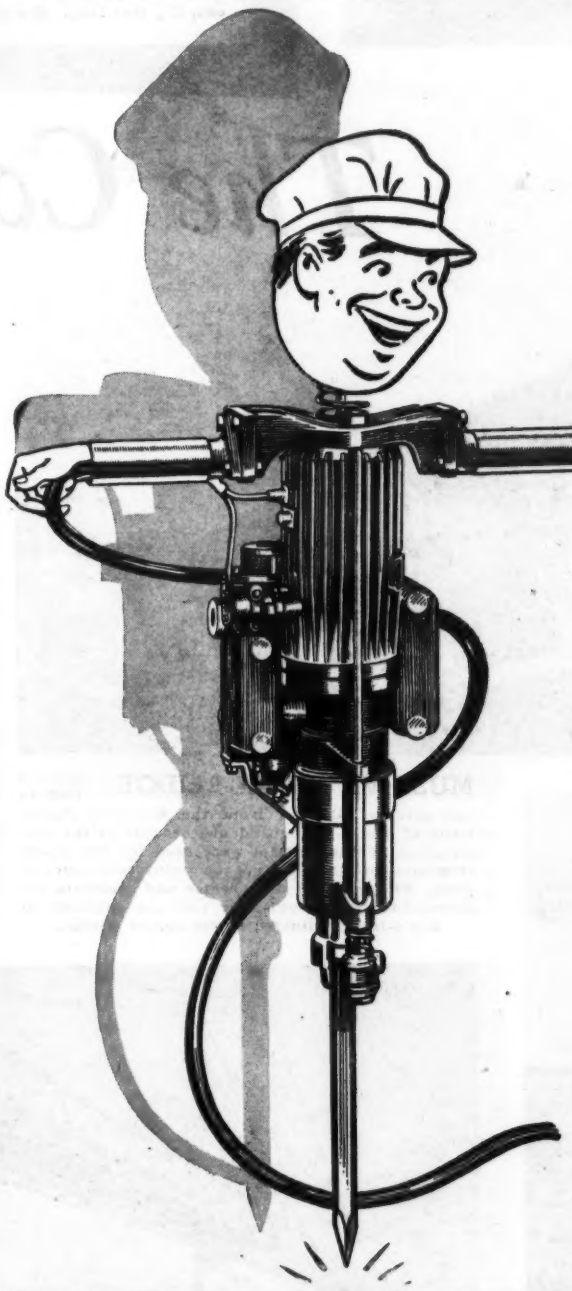

"I MAKE LIGHT WORK OF HEAVY JOBS"

Drilling, digging, driving, breaking or tamping

The tougher the job the greater your need for a low-cost Barco Portable Gas Hammer. A self-contained unit, it is portable under any conditions. With eleven special tool attachments available, you can meet any job on the spot. Barco Manufacturing Company, Not Inc.

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Gentlemen:

Without obligation on my part please send me a copy of the BARCO HAMMER BOOKLET.

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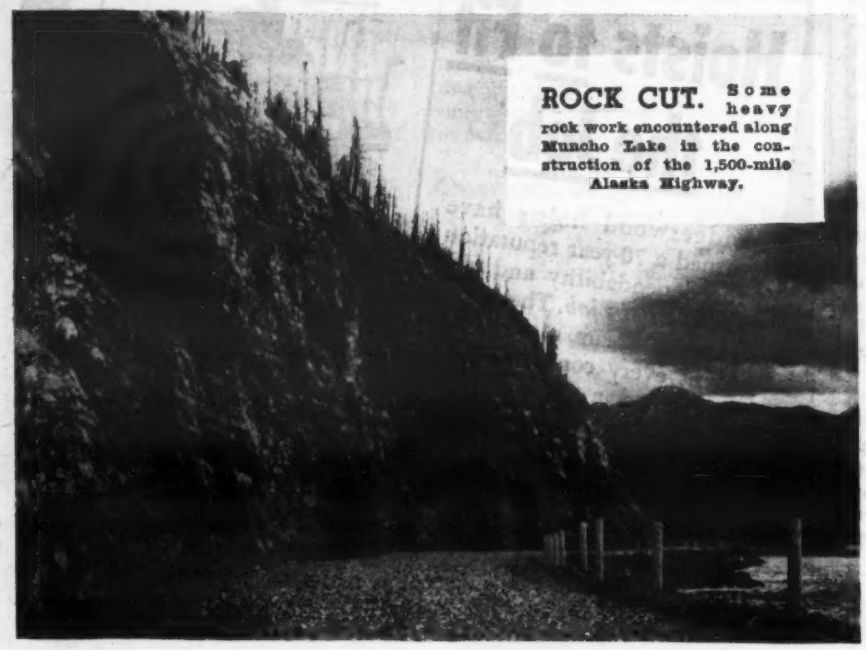
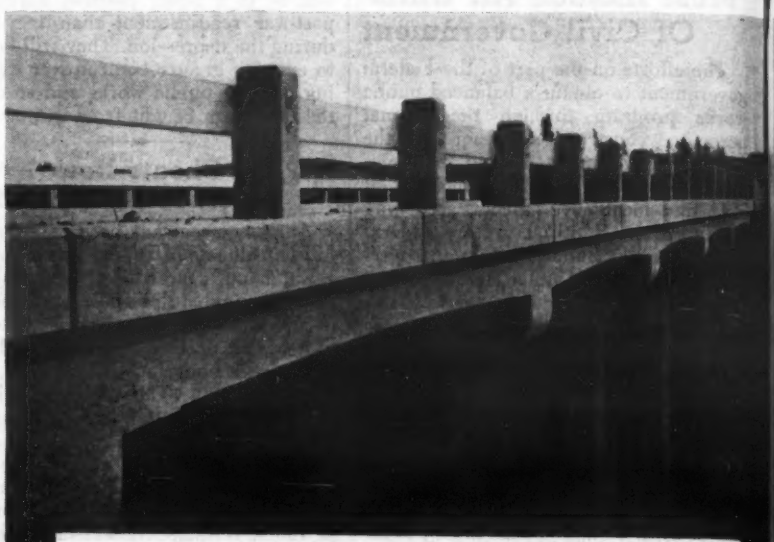
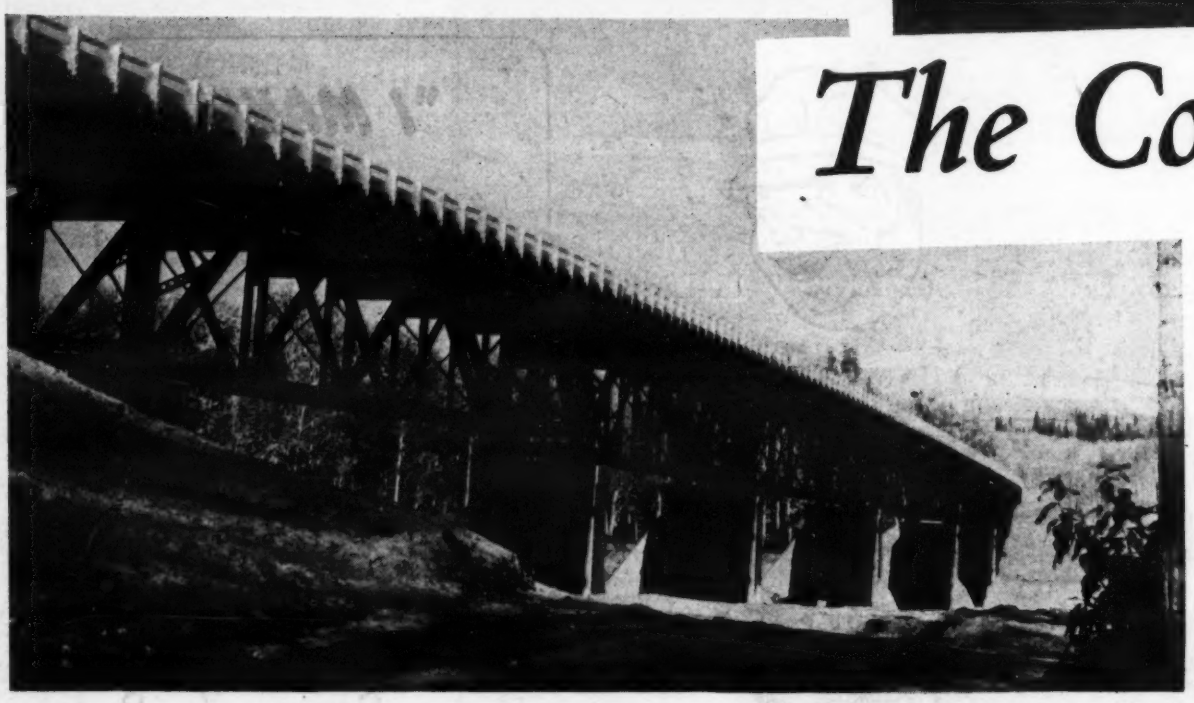


ROCK CUT. Some heavy rock work encountered along Muncho Lake in the construction of the 1,500-mile Alaska Highway.

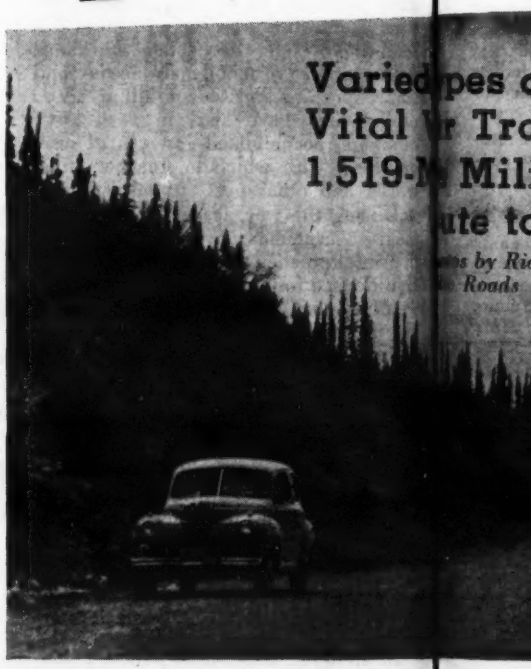


BEATTON BRIDGE. This concrete structure has five 20-foot spans and two cantilever spans on each end, 5½ feet long. The roadway is 24 feet wide.

The Completed Al



MUSKWA RIVER BRIDGE. Steel trusses and girders salvaged from the Southern Pacific Railroad which was abandoned because of the construction of Shasta Dam were used for the superstructure of this bridge, on reinforced-concrete piers. The roadway floor beams and stringers are creosote-treated Douglas fir and the roadway of 2 x 6-inch laminated native-spruce timber.



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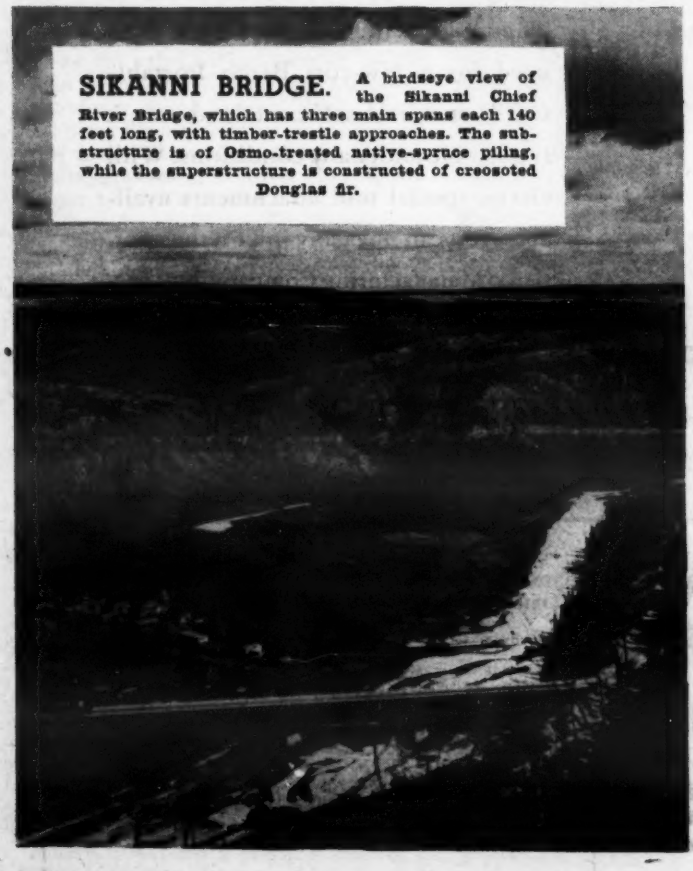

SIKANNI BRIDGE. A birdseye view of the Sikanni Chief River Bridge, which has three main spans each 140 feet long, with timber-trestle approaches. The substructure is of Osmo-treated native-spruce piling, while the superstructure is constructed of creosoted Douglas fir.

PEACE RIVER BRIDGE, one of the largest structures on the Alaska Highway. The main span is 930 feet long, with two side spans each 465 feet long and two 135-foot deck truss approach spans.

EASY GRADE Alaska H
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way to Alaska. The d surface
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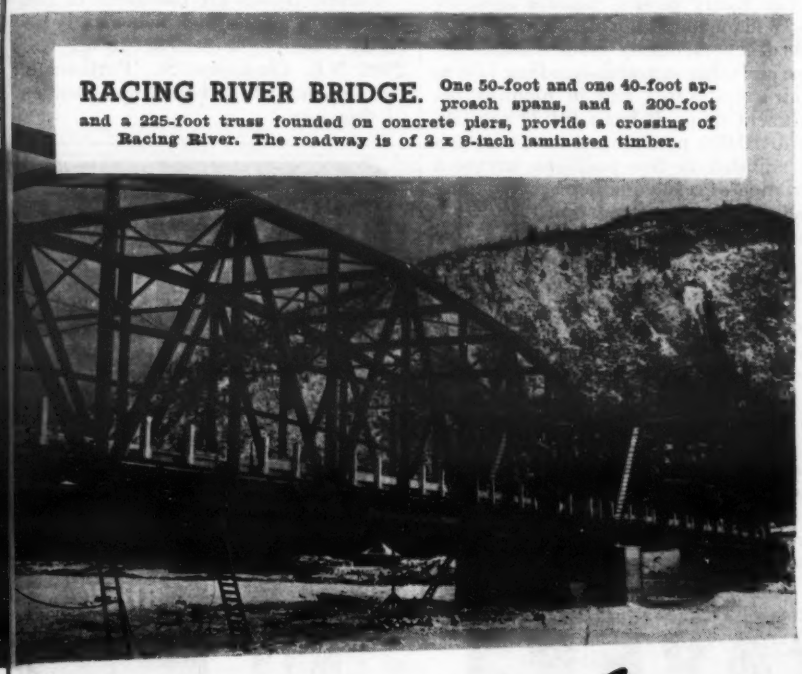
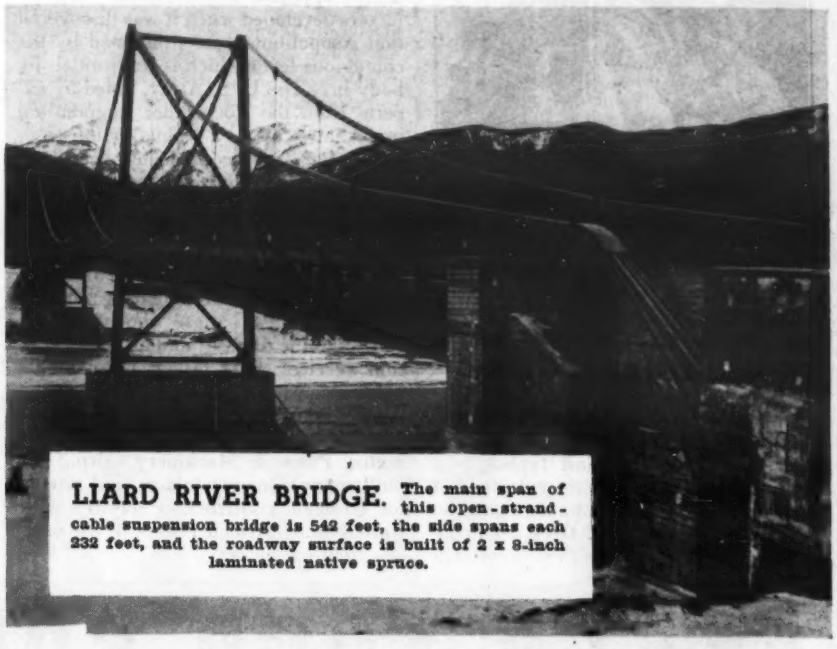


RACING RIVER BRIDGE. One 50-foot and one 40-foot approach spans, and a 200-foot and a 225-foot truss founded on concrete piers, provide a crossing of Racing River. The roadway is of 2 x 8-inch laminated timber.



LIARD RIVER BRIDGE. The main span of this open-strand-cable suspension bridge is 542 feet, the side spans each 232 feet, and the roadway surface is built of 2 x 8-inch laminated native spruce.

Alaska Highway

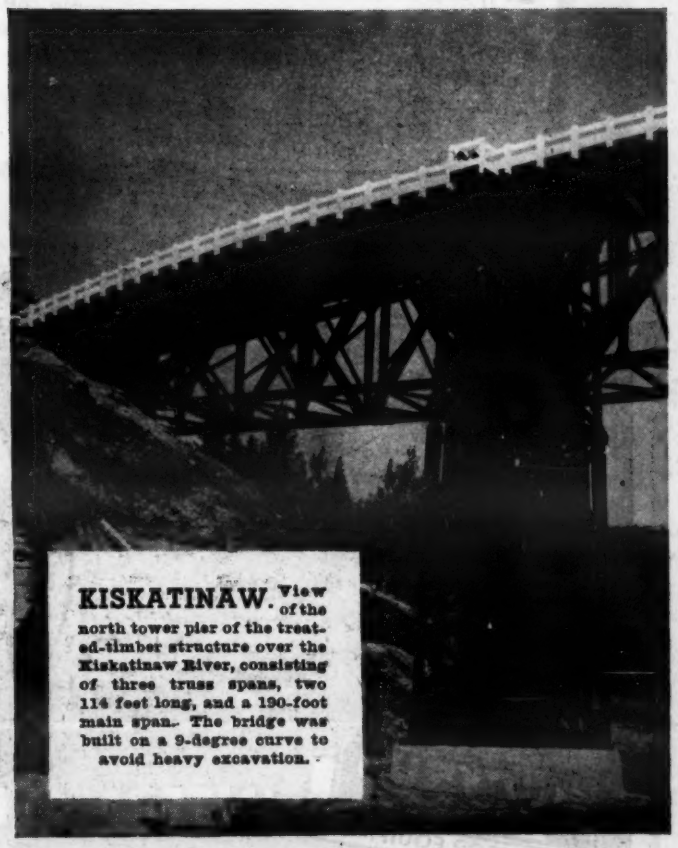
...pes of Bridges Serve ... Traffic Using the ... Military Overland ...ute to Alaska

...s by Richard R. Tipton, ... Roads Administration)

TOAD RIVER BRIDGE. Approaches leading to this river crossing consist of a 23-foot and a 28-foot span at one end and a 25-foot span at the other, all of reinforced concrete. The main steel truss span is 160 feet long.

...ADE Alaska Highway rolls ...gh scenic Racing River ...he ma... valleys on its 1,500-mile ... The g...d surface was unfinished ...hen th... was taken.

CAMP. The Public Roads Administration Camp at Fort St. John, B. C., at noon on Christmas Day. The long shadows at mid-day are characteristic of this northern latitude.



KISKATINAW. View of the north tower pier of the treated-timber structure over the Kiskatinaw River, consisting of three truss spans, two 114 feet long, and a 190-foot main span. The bridge was built on a 9-degree curve to avoid heavy excavation.

Acme Photo by Bert Brandt, War Pool Photographer
A Ransome 14-S mixes a new kind of batch—DDT delousing powder.

A 14-S Mixes It Up With Typhus In Italy

Aiding the U. S. Army in Naples, Italy, in the fight against typhus is a Ransome 14-S concrete mixer. Instead of its usual function of producing concrete, it is being used to blend DDT delousing powder with Italian talc to prevent skin irritation.

This unusual and probably unprecedented application of Ransome concrete mixers developed when it was discovered that Neopolitans were prostrated by the contagious fever which is transmitted by body lice. The U. S. Army, aided by experts from the Rockefeller Foundation, immediately set up a typhus commission, consisting of five coordinated branches: a Case Finding Unit; a Contact Delousing Service which dusts unsanitary living conditions with a special lice-killing powder; a Mass Delousing Service with stations throughout the city; a Flying Squadron which investigates reported cases and "dusts" those who have been subject to the disease; and an Immunization Service whose task it is to handle vaccinations.

Ransome Concrete Machinery Co., Dunellen, N. J., a subsidiary of Worthington Pump & Machinery Corp., has built many concrete mixers and pavers for strategic construction services with United States Armed Forces in the various fighting zones.

General Utility Crane

The Karry Krane, manufactured by the Willamette Hyster Co., is a self-propelled general utility crane suitable for pipe and other materials-handling jobs in contractors' yards and in highway department shops. It has a lifting capacity up to 10,000 pounds and the boom can be adjusted to five positions, giving a variation of reach and height to suit any load. The boom extends out to 9 feet 8 inches or up to 19 feet 4 inches. One lever controls the lifting and lowering of loads.

The trunnion-design steering mechanism permits the crane to turn on its own length, making it possible to operate in close quarters. No overhead crane or loading platform is required. Mounted on six pneumatic tires, the Karry Krane is equipped with standard automotive controls and a Hercules 4-cylinder industrial-type power plant. It is capable of speeds up to 10 miles per hour, both forward and backward, which eliminates loss of time in turning around and allows full vision when handling exceptionally large loads.

Further details are contained in Bulletin 658-B, copies of which may be secured from the Willamette Hyster Co., 2902 N.E. Clackamas St., Portland 8, Ore., upon written request and mention of this item.

KEEP YOUR SCRAPER IN Fighting Trim...

Your 4-wheel scraper is a fighting tool and must be kept at original working efficiency. Maintenance is no longer a question of individual operating costs only—it is an obligation we owe the United Nations, a means to get more material to the far-flung theaters of war through capacity production and conservation of equipment. Help pave the road to victory by following these hints.

1. Follow a regular schedule of lubrication and inspection. Correct troubles before they become serious.
2. Disassemble and clean sheaves periodically to prolong the life of bearings and pins.
3. Check all cable leads to see that ropes are properly aligned to prevent undue rope wear.
4. If a sheave-stand is bent, straighten it before the bad off-lead damages or cuts the cable.
5. Avoid unnecessary cable strain—do not travel with ejector, apron or bowl at extreme height.
6. If cutting edge shows wear, build it up by welding before lip casting becomes damaged.
7. Check all bolts and cotter pins regularly and watch tire inflation.

Bucyrus-Erie scrapers are built to handle the large-scale, high-speed dirt-moving jobs required by wartime production schedules. But even these rugged digging units need vigilant care to give victory performance day after day, job after job. Your International TracTracTor distributor will be glad to help you with a practical maintenance program.

P144-C

BUCYRUS ERIE TRACTOR EQUIPMENT
INTERNATIONAL TRACTRACTOR

CASE EVIDENCE
That Will Help You Decide Whether You Can Profit by Installing a JOHNSON BULK CEMENT PLANT

• The Johnson Bulk Cement Plant is engineered and built to eliminate the extra expense and double labor of handling large quantities of cement in bags. With this plant, carload shipments of bulk cement are handled at savings that, in many cases, cover the full cost of the equipment and installation in one year.

Here's a typical example: A midwestern Central Mixing Plant, consuming 15,000 barrels of cement a year, is installing a Johnson Bulk Cement Plant. Savings through buying in bulk instead of in bags, 5 cents per bbl. Savings on the cost of moving bags from car to warehouse were estimated to run from 5 cents to 6 cents per bbl. A further saving of 4½ cents results from the elimination of labor incident to opening bags and handling in the mixing plant. Total savings through the use of bulk cement were estimated by the operator at $2325.00 for one year's operation.

In addition, this operator estimates that the accurate and uniform weighing, made possible by the Johnson Batcher, eliminated waste caused by a split-bag specification . . . saving the cost of an additional 400 bbls. annually.

With this practical example as a basis, make your own calculation in terms of your annual volume . . . and decide for yourself whether and how much you can profit by installing a Johnson Bulk Plant.

Write for Data on Johnson's
ELEVATORS • CLAMSHELL BUCKETS
CEMENT STORAGE SILOS • BATCHERS

the C. S. JOHNSON COMPANY
Champaign • Illinois

FEATHER the nests of our multiplying warbirds—or there will be no nests left to any of us. Buy Bonds. CONSERVE, stimulate, protect—all in one—buying Bonds.

Erection of Trusses For Army Warehouses

(*Continued from page 27*)

A crew of 22 laborers and 25 carpenters was used for the entire operation at the cutting and assembly yard. Under ordinary conditions this crew completed six trusses per day. After the trusses had been completely assembled to be certain of a perfect fit, they were separated into four sections to facilitate hauling. One section was approximately 68 feet long and the other three sections averaged 45 feet in length.

A ⅝-yard Lorain crane with a 25-foot boom handled the truss sections from the jigs onto the trailer trucks which were used to transport them to the erection site, approximately ¼ mile from the assembly yard.

Field Erection of Trusses

The buildings in which the trusses are used are 750 feet long and 200 feet wide. The trusses rest on concrete-filled hollow-tile columns 14 feet 7 inches high, set at 16-foot intervals in the walls. Each built-up column is 24 inches square and contains two ¾-inch anchor bolts to fasten the truss to the column.

Erection was started at the back of each building and proceeded, truss by truss, to the front. The trailers carrying the truss sections were driven into the building in a line at right angles to the center lines of the trusses and accurately parked at a predetermined location.

When the trailers were in position, a bridle of two pieces of ¾-inch wire rope, connected at their junction with a steel ring, was passed through the top chord of each section of truss and looped around the bottom chord. The sections were picked up by a Northwest crane with a 45-foot boom. The bridle was so adjusted to the truss sections that one end was carried somewhat lower than the opposite end and the lower end was guided into position by a rope handled by one man on the ground. Two carpenters, working on a rolling platform of steel scaffolding, were in position to guide the final setting of each section, either onto the anchor bolts of the end columns or onto and through the projecting members of the previously erected interior columns made of three 3 x 12-inch timbers bolted and blocked to form columns.

These interior columns, which were fabricated with the truss which was to rest on them so as to assure perfect fit at the time of erection, had been previously set in position and bolted to their foundation blocks. A rolling A-frame mounted on 6-inch iron casters and equipped with a ½-inch cable controlled by a Ramsey 5-ton hand winch was used to erect the columns.

Each truss section was swung through an arc of 270 degrees from the trailer to its final position. Three additional carpenters, working from a second steel rolling platform, completed the bolting together of the truss sections and the tie-bracing between trusses. The entire erection crew consisted of the truck driver, the crane operator, a laborer, and five carpenters. This crew was able to complete the field erection of the six trusses delivered from the yard each day.

Personnel

The subcontract for the fabrication and erection of these trusses was completed by T. H. Pearce Co. of Columbus, Ga., with C. W. Duck as Superintendent. Smith, Yetter & Griffin of West Palm Beach, Fla., was the general contractor for the warehouses. All work was supervised by Holabird & Root, Architect-Engineers, Chicago, Ill., under the direction of the Corps of Engineers, U. S. Army, with Major E. B. Boynton as Area Engineer.

Iowa reports that she will have from $1,500,000 to $2,000,000 to spend on new highway equipment at the end of the war.

CHEVROLET CARS AND TRUCKS

. . . provide wartime transportation and haulage service for more workers and industries than do cars and trucks of any other make.

. . . carry one-fourth of all passenger car and truck traffic for a working nation at war.

. . . lead every other make of car and truck in number of car owners throughout the United States.

CHEVROLET DEALERS

. . . were first among all dealer organizations to provide wartime car and truck conservation service.

. . . provide wartime service for more cars and trucks than does any other automotive dealer organization.

. . . service cars and trucks of all makes to maintain America's wartime motor transportation system.

CHEVROLET MOTOR DIVISION, General Motors Corporation, DETROIT, MICHIGAN

"SAVE THE WHEELS THAT SERVE AMERICA"

Every Sunday Afternoon, GENERAL MOTORS SYMPHONY OF THE AIR, NBC Network

TO SPEED VICTORY . . . BUY WAR BONDS

EXPERIENCE builds 'em PERFORMANCE sells 'em

on ROGERS TRAILERS

TODAY even airplanes "bum a ride" on ROGERS TRAILERS. Deck houses for Victory ships . . . huge coastal defense guns . . . giant tanks, all are speeded towards completion and rushed to the fighting fronts on ROGERS TRAILERS.

In War and in Peace ROGERS TRAILERS have proven their ability to "deliver the goods". New models which will be available when war contracts are completed will be even better-engineered . . more efficient than the thousands which have been used successfully by industry for many years.

ROGERS BROS. CORPORATION
ALBION,
PENNA.

Change of Address

(Mail to Contractors and Engineers Monthly, 470 4th Ave., New York 16, *today*)

From _____
(Former address)
_____
_____

To _____
(New address)
_____
_____

Name_____
Firm_____
Position_____

Care of Equipment In Ala. Division Shop

(*Continued from page 42*)

side and a chute opposite for delivery of the gravel to the truck being loaded. The frame has bolted extensions so that they can be removed when the outfit is being rolled and replaced when it is set up for loading.

Heavy equipment is stored in the yard and also an extra repair stall has been set up, protected by a tarpaulin over a pipe frame. A tractor was being overhauled in this open-air stall when we saw it.

An interesting demonstration of erosion control is afforded by the endeavor of the Division shops to protect themselves from being washed into a deep gully back of the shop. A stream running through this gully has made serious inroads on the shop yards, and where the drain from the washstand runs into the gully, great slides have taken place. Two methods of control have been used, both with considerable degrees of success. For most of the gully area adjacent to the shops and yard, kudzu vine has been planted, and its rapid growth and heavy root system has cut the erosion to almost nothing. In the section where waste oil, washings from cars, and chemicals have made it impossible to maintain any plant growth, the erosion has been checked, although not stopped, by dumping in waste, such as cans, brush, plaster, and other clean debris, which has stopped the excessive wash of the water in the easily eroded ground.

Personnel

The Grove Hill Shops of Division 6 of the Alabama Highway Department are operated under the direction of A. P. Villadsen, Division Engineer, with W. B. Coleman as Division Equipment Superintendent.

Truck Tire Improved

The Speedliner Silvertown truck tire, manufactured by the B. F. Goodrich Co., Akron, Ohio, has been redesigned and reconstructed for better wear, it is reported, and is now available in size 7.50-20 eight-ply or larger.

The principal changes in design are the reduced tread thickness at the shoulder and the addition of new ventilating grooves in the shoulder blocks to lessen operating heat. The thicker side wall reduces the danger of cracking, and the shallower construction of the ornamental rib on the side wall provides better distribution of pressure.

Heat has always been the truck tire's greatest enemy, and its reduction is of prime importance now that the life of every truck tire must be stretched to the utmost. The manufacturer states that its new design makes the Speedliner run cooler, which means longer tire life, greater possibility of recapping, and more miles and tons per dollar.

IT JETS POINTS IN

...and DRIES THE JOB!

Many small construction jobs can be dried with a one pump wellpoint system but an *additional* jetting pump is needed to install the wellpoints. The *rental* charge for the jetting pump is nominal, but the *freight* cost runs into *real money*—particularly the return ride at LCL rates. The way to save this expense is the JET'N DRY wellpoint pump. Use it first for *jetting*, then hook it to the wellpoint system and *dry* the job. If you need a larger capacity you can *boost* the volume of the Model 64 pump from 650 gpm to 1700 gpm by a simple mechanical change made right in the field. This means an actual saving of round trip freight and rental cost of *one* pump. No other pump has this convertible feature.

FOR RENT AND FOR SALE

MID-WEST
GRIFFIN EQUIPMENT CO., INC.
548 Indiana Street • Hammond 1662
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MAIN OFFICE: 881 EAST 141st STREET, NEW YORK 54, N. Y.
GRIFFIN WELLPOINT CORPORATION

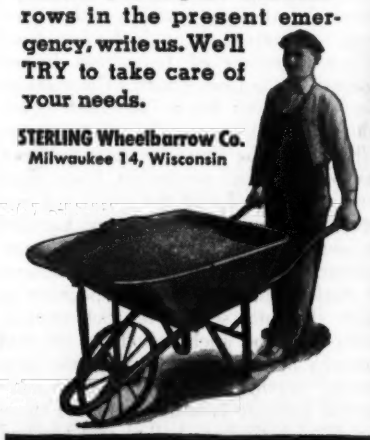
Sterling's
"EASY WHEELING" PREDECESSOR

For centuries, the wheelbarrow has been a common means of passenger transportation in China. The large wheel reduces rolling resistance, and only a minimum of weight is thrown on the operator's arms.

Today, Sterling Wheelbarrows continue to apply that same logical, labor-saving principle. Sterling "Easy Wheeling" features provide a simple, flexible means of material transport. On small, everyday jobs, or on huge war projects, Sterlings fill the bill, economically.

Should you require wheelbarrows in the present emergency, write us. We'll TRY to take care of your needs.

STERLING Wheelbarrow Co.
Milwaukee 14, Wisconsin



Sterling S
Look for this Mark of STERLING Quality
WHEELBARROWS

A 4359-⅛

PARSONS

For extra wide trenches, not too deep, dual booms may be effectively used.

For Speed in Digging Pipe Line Trenches

Trees, Poles, steep banks and other obstructions won't halt your pipe line digging when you are using a Parsons Trencher with the shiftable offset boom. Excavations may be made with boom in extreme right or left hand position, without sacrifice of speed or ease of operation. With a Parsons you can dig within 14 inches of a side obstruction, and on line with outside edge of either crawler. This one Parsons feature alone will save hours of digging time.

for complete details write
THE PARSONS COMPANY
NEWTON, IOWA

TRENCHING EQUIPMENT

if treated in time
cancer
can be
cured

Learn the danger signals! Get early diagnosis and prompt treatment. Delay is dangerous!

AMERICAN SOCIETY FOR THE CONTROL OF CANCER

One of the new hot-mix sidewalks along Sea Island Drive in Glynn County, Ga.

Economical Sidewalks To Fit Suburban Area

The hard and fast straight-line sidewalk may fit the city street but in the residential suburb it is far from attractive and does not suit the character of the community. A method of overcoming this rigidity of line with great economy in construction was used on Sea Island, Ga., by the highway engineer of Glynn County. A contract was awarded to W. L. Cobb Construction Co. of Decatur, Ga., for several miles of new sidewalk when both pedestrian and motor traffic increased on Sea Island Drive, endangering those who were forced, by lack of sidewalks, to walk in the streets.

A tentative line for the sidewalk was carefully laid out without respect to the center line of the street but kept within the right-of-way, following the contour of the ground and weaving around the trees so as to preserve the beauty of the terrain.

The sidewalk was laid 6 feet wide, using tamped local sand as a base, with a 2-inch base course and 1½-inch top course of hot-mix consisting of local sand with 7½ per cent of 90 to 120-penetration asphalt. The local sand provided a fairly well-graded two-way sheet-asphalt mix, with not more than 4 to 5 per cent passing the 200-mesh sieve and all passing the No. 10 sieve.

Forms of parallel 2 x 4-inch lumber were used and the hot-mix hand-spread and raked between them, followed by rolling with a 2-ton power roller. The mix was left ¼ to ½ inch high and the forms were not removed, thus providing a tight edge for a period long enough for the material to set up as strong as it ever could and not ravel.

We are indebted to H. J. Friedman, Engineer-Director of Glynn County, Brunswick, Ga., for this information.

The provincial government of Hunan, China, plans to build 4,638 kilometers of highways in the province during 1944.

Rechargeable Batteries For All Flashlights

Users of flashlights will be interested in an effective folder on rechargeable storage batteries recently distributed. The Ideal flashlight storage battery, it is stated, may be recharged hundreds of times, and many are now in service which have had two or even three years of regular use. The need for frequent charging, for periods of from 5 to 15 hours, is emphasized, depending upon the amount of use the flashlight receives, and a long overcharge every 30 to 60 days is recommended for maximum performance. The manufacturer claims that a single Ideal rechargeable storage battery can outlast 400 or more dry cells, which means a saving not only in expense but in critical materials.

Amusing cartoons illustrate the text of this instruction folder, copies of which will be forwarded upon application to the Ideal Commutator Dresser Co., Storage Battery Division, Sycamore, Ill. Just mention this review.

Announcement

Effective March 1st

The Celotex Corporation
has taken over the
National Distribution
of

FLEXCELL
REG. U.S. PAT. OFF.

BITUMINOUS FIBRE EXPANSION JOINT

★

We invite your inquiries
for expansion joint products

★

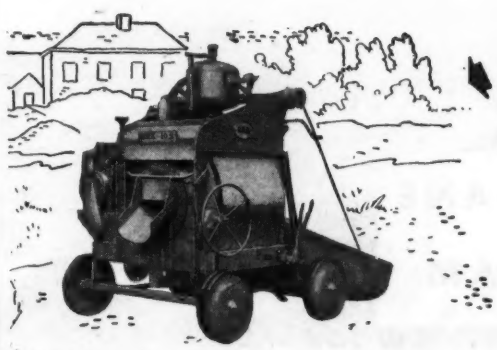
Our 14 Branch Offices
and
Flexcell Distributors
are prepared to offer prompt
cooperation and service

★

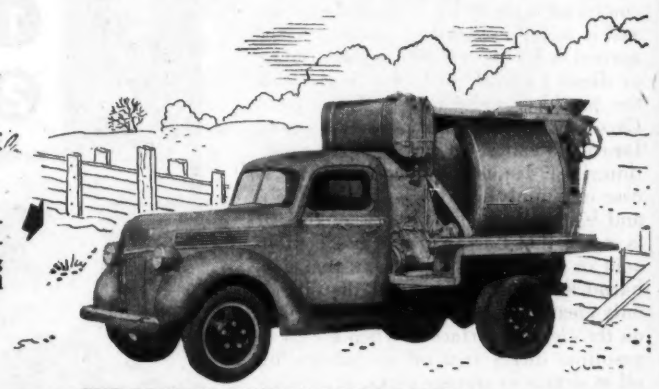
THE CELOTEX CORPORATION
Flexcell Department
120 S. La Salle, Chicago 3, Illinois

World's Largest Manufacturers of
BITUMINOUS FIBRE EXPANSION JOINT

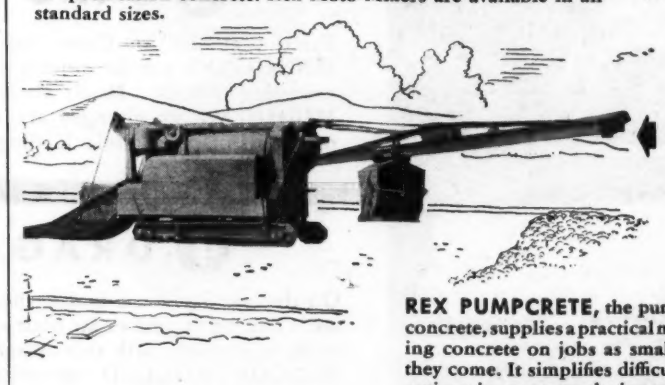
FOR EFFICIENT-ECONOMICAL CONCRETE CONSTRUCTION AND MOVING OF WATER



REX MIXERS are leaders at the job of producing high quality concrete for everything from basements to bridges . . . factories to homes. Soundly designed and ruggedly built for top performance, they speed up mixing and placing concrete wherever they are used. Available in 3½S, 5S, 7S, 10S, 14S and 28S sizes.



REX MOTO-MIXERS are proved superior by actual job performance and operator preference. Simplicity and ease of operation result in most efficient and economical mixing and placing of specification concrete. Rex Moto-Mixers are available in all standard sizes.



THE REX 34E DOUBLE DRUM PAVER has an unusual performance record for high volume production and smoothness of handling. Operation is controlled by the Rex Mechanical Man, resulting in the fastest possible mixing cycle. The Rex Paver is by far the most modern and efficient paver built.

REX PUMPCRETE, the pump that pumps concrete, supplies a practical means of pumping concrete on jobs as small or as big as they come. It simplifies difficult jobs, effects savings in concrete placing costs and better co-ordinates all operations to permit faster completion of entire job. It eliminates the need for buggy runs, chutes, hoists and towers. Capacities range from 15 to 65 cubic yards per hour.

REX SPEED PRIME PUMPS are high capacity, self-priming, centrifugal pumps used for general dewatering and supply purposes for construction jobs. They are sturdily built, with capacities ranging from 3000 up to 125,000 gallons per hour. Gasoline or electric power operated.

Rex Engineers are specialists in the design, manufacture and application of equipment for mixing, hauling and placing of concrete and the moving of water. Write for illustrated booklets containing the complete facts and engineering data. Address Chain Belt Company, 1666 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT COMPANY
of Milwaukee

REX
CONSTRUCTION MACHINERY

U. S. Army Signal Corps Photo

The Adams tamping roller developed for Aviation Engineers of the U. S. Army Air Forces. This and similar road-building equipment are flown to captured enemy airfields to condition them quickly for use by our planes.

New Engine Additive Cleans, Lubricates

Among the services claimed for the engine cleaning and lubricating compound Carsolac are the removal of carbon and its elimination through the exhaust, protection against corrosion, the prevention of piston seizure, lubrication of the firing zone regardless of firing temperature, the removal of sludge, paraffine and varnish, a reduction of run-in time for new or reconditioned engines, the maintenance of constant lubrication on rocker-arm assemblies, the cleaning of oil screens, and a reduction in operating and maintenance costs, according to a recent bulletin by the distributor, the Atlantic Aviation Institute, Inc., 65 Prospect St., Trenton, N. J.

Carsolac consists of a high-grade oil acting as a base for various chemicals combined with it by a special process and is added in specified amounts to the normal crankcase oil and to the gasoline or diesel fuel oil used. For initial use, the producer recommends 2 quarts of Carsolac for the crankcase and ½ pint for each 5 gallons of fuel, while for continued use, 1 quart is added to the crankcase oil supply with each change of oil, and ¼ pint to each 5 gallons of fuel. It is stated that Carsolac does not contain acid or graphite in any form, that it is harmless to all alloys, and that it not only cleans but also leaves an oil deposit on the cleaned surfaces. When added to gasoline, diesel fuel oil or lubricating oil in drums or storage tanks, it remains in suspension and does not settle.

When used in engine fuel or crankcase oil, Carsolac dissolves carbon and varnish binders from cylinder heads, pistons and valves, softening heavy hard carbon deposits so that they are removed through the exhaust. In addition, Carsolac is designed to lubricate piston rings and cylinder side walls with a tough oily film to prevent adherence of foreign matter to those parts. It is reported that this additive dissolves sludge in the crankcase, holding it in suspension so that it can be drained off when the crankcase oil is drained. When equipment is being prepared for storage, Carsolac may be used to prevent corrosion.

Copies of an 8-page bulletin on Carsolac, which has been in use for over 14 years by operators of large fleets of trucks, taxicabs and buses, may be secured by those interested direct from the distributor. Just mention this item.

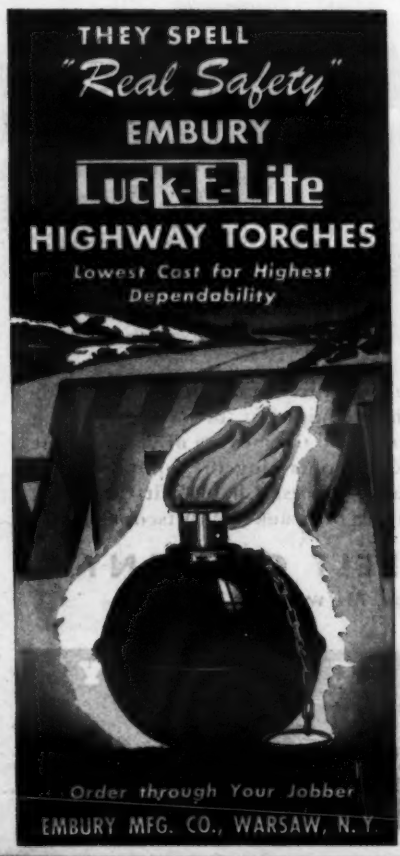
Doner Appointed Manager Of C-P Rock Drill Sales

Announcement has been made of the appointment of George B. Doner to the position of Sales Manager of the Rock Drill Division, Chicago Pneumatic Tool Co., with headquarters at the Executive Offices, 6 East 44th St., New York City. Previous to this appointment, Mr. Doner was connected with the Mining Department of the subsidiary company, the Canadian Pneumatic Tool Co., Montreal, Canada, having been Branch Manager at Timmins and Kirkland Lake for nineteen years.

Catalog Describes New Photo-Copy Unit

An easily-operated photo-copy machine which, it is stated, will make clear, non-fading copies of anything that is written, printed, drawn or photographed is described in a folder-form catalog just received. This A-PE-CO unit can be used to advantage in contractors' offices for the duplication of blueprints and specifications, and for copying records and other data in state and county highway departments. Besides saving extra copying or tracing, it eliminates the need for proofreading, a particularly valuable asset in these days of help shortage. The machine weighs 10 pounds, measures 12 x 12 x 24 inches, operates on ac or dc current, and will handle copy up to 18 x 22 inches.

Complete information and demonstration by a local representative will be supplied upon application to Dept. 310, American Photocopy Equipment Co., 2849 N. Clark St., Chicago 14, Ill. When writing, please refer to this item.



MICHIGAN can do 5 JOBS for YOU
1 CRANE
2 CLAM
3 SHOVEL
From Clamshell or Crane use, the ⅜ yard and ½ yard MICHIGANS can be quickly converted to shovel use by changing booms. Much time is saved because in the MICHIGAN, no changes are necessary in the operating mechanism. Full circle loading.
4 DRAGLINE
On the regular crane boom, the Michigan Dragline equipment can be rigged in an hour or less. An unusually long reach is possible with this attachment, and the high speed, AIR-CONTROLLED operation of all MICHIGANS means added work capacity.
5 TRENCH HOE
This attachment, with its eleven-foot digging depth, finds scores of uses in public works and private construction.
Trench Hoe is available for both ⅜ yard and ½ yard models, as are all attachments pictured here.
AIR CONTROLLED
WRITE FOR
½ YARD BULLETIN CE44T
AND ⅜ YARD BULLETIN CE44K
MICHIGAN
POWER SHOVEL CO.
BENTON HARBOR, MICHIGAN

Back Post-War Plans, Contractors Are Urged

Thos. H. MacDonald Questions AGC If Construction Industry Is Doing Its Share in Post-War Planning

+ "FROM the extent and types of construction proposed for inclusion in the overall highway improvement program, there must stem the multiple estimates of equipment, tools, materials, organization, transportation, numbers of workers and all the essential elements required. Many of these must go through the time-consuming stages of production before large-scale construction operations can possibly start," Thos. H. MacDonald, Commissioner, Public Roads Administration, stated at the beginning of an appeal to members of the Associated General Contractors of America to see to it that everything is done in their communities and states to create the plans that are the foundation of any construction that can be done in the post-war years.

Due to the years during which there has been little or no new construction equipment available for contractors and practically none for the use of the states which have made such an heroic endeavor to maintain our highways in serviceable condition, the backlog of construction equipment in first-class working condition now, plus the depletion inherent in war demands yet to come, does not inspire confidence that we can quickly put into actual operation a large construction program with the essential qualities of down-to-earth prices and sound workmanship, according to "Chief" MacDonald.

Considering all of the conditions that have prevailed during recent years, and that will continue for an indefinite period, it is not unreasonable to fear that the weak link in undertaking a large post-war construction program will prove to be the construction industry itself, points out the head of the Public Roads Administration in a rather pessimistic mood. Much emphasis has been placed upon two elements of a highway construction program: first, the funds required, and second, the preparation of detailed plans ready for taking of bids. So far, there has been little attention given to the third and very vital element of the ability of the construction industry to absorb quickly, and place under way immediately, a large construction program.

It was then pointed out that the work done recently by the construction industry on a wide variety and extent of projects, completed in less than record time, has never before been approached. But these were war projects undertaken without counting the cost, and with the driving motive of patriotic desire of each man to contribute his full share and more. The post-war construction program, regardless of type, must be undertaken on a peacetime basis. Low costs resulting from organizational efficiency and high-type workmanship must prevail if it is to merit continuing public support.

Financing

In the matter of funds from Federal sources, the Congress will determine the extent. In this connection, it will be necessary to take into account the fact that for a long period the major highway expenditures through state and local sources have come from receipts from motor-vehicle taxes which have shrunk sadly under wartime restrictions in the use of motor vehicles and fuel. This decrease of income is further accented as to state and local funds available for construction by the increased maintenance

(*Concluded on page* 68)

ALL OVER THE WORLD
TORO
POWER MOWERS
TORO MANUFACTURING CORP'N.
MINNEAPOLIS, MINN.
MOWING MACHINERY SPECIALISTS FOR OVER 20 YEARS

MARVEL-KOTE MEMBRANE CURING COMPOUND FOR ALL CONCRETE SURFACES
Meets Federal and State Specifications
ALSO
SUBGRADE PAPER
meeting Federal and State Specifications
WATER-PROOFING SPECIALTIES
CONCRETE CHEMICAL CO.
338 Railway Exchange Bldg.
Kansas City, Mo.

"but you don't need a Crystal Ball"
10-S MIXER
THIS MACHINE COMPLIES WITH A.G.C. STANDARDS
IT IS GUARANTEED TO HOLD AND PROPERLY MIX 10 CUBIC FEET OF CONCRETE PLUS 10% WHEN OPERATING ON THE LEVEL

You can throw away that "crystal ball" method of estimating whether your mixers and pavers carry the A.G.C. Rating Plates. Capacity and performance are guaranteed to the last yard. Just think what that means today when you've got a million things that need attention.

When you estimate a job, you can be certain that your mixers and pavers will deliver the full rated capacities you've allowed in your plans. The A.G.C. Rating Plate guarantees reliability in action and production.

Next time you get a mixer or paver, insist on one that bears the A.G.C. Rating Plate. You won't regret it!

MIXER MANUFACTURERS BUREAU
Affiliated with the Associated General Contractors of America, Inc.

Chain Belt Company, Milwaukee, Wis.
Construction Mach. Co., Waterloo, Iowa
Koehring Company, Milwaukee, Wis.
Ransome Machinery Co., Dunellen, N. J.
The Lakewood Eng. Co., Columbus, Ohio
The Foote Co., Inc., Nunda, N. Y.
The Jaeger Machine Co., Columbus, Ohio
The T. L. Smith Company, Milwaukee, Wis.
The Knickerbocker Co., Jackson, Mich.

Clean Lubricants Will Serve More Effectively

(*Continued from page 34*)

of 150 to 200 seconds Saybolt at 210 F, has proved satisfactory.

Handling Lubricants

Along with the type and extent of refinement of the lubricants employed, the means whereby they are applied or distributed has a marked effect upon their ability to insure efficient and economical gear operation. Obviously, even the best of lubricants may function ineffectively if they are unable to cover the contact surfaces of the teeth.

Probably more failures and complaints arise from ineffectual lubrication through misusage of lubricants than from any other average operating condition. In many cases, these can be traced to ignorance; in others, to lack of appreciation of the lubricating requirements. With an understanding of the latter and knowledge of the lubricants which are available, protection of gears in machines on construction jobs should be materially simplified.

Each operator, however, must study his own particular operating conditions, then use his lubricants intelligently, in accordance with the recommendations of the manufacturers of his machinery and the oil company from whom he purchases his lubricants. Makeshift or obsolete ideas may have been permissible in the past; today, the necessity for maximum production and maximum service life demands the adoption of the most modern means of lubrication.

Indication of Wear

Wear in gears and driving chains is indicated by excessive noise. As a general rule, there is better ventilation for gears in construction equipment than prevails with the average bearing and, in consequence, increase in operating temperatures usually will not be as marked, even in extreme cases of faulty lubrication of gear teeth or chain link connections, since radiation serves as an effective means of temperature reduction. Development of continued noisy clanking operation is a decidedly positive indication that a gear or chain lubricant is not functioning effectually as a preventive of metallic contact and solid friction.

Fortunately there are regular periods over which a gear lubricant is inactive, for actual contact between the teeth occurs only when they are in mesh. To a somewhat less extent, the load imposed upon a chain link connection is also decreased during the period of slack operation.

Chain lubrication, however, more nearly approaches bearing lubrication in the requirements which are imposed upon the lubricants. Yet there is more chance for lubricant to be thrown off from a chain link than from the average bearing, for even though bearings themselves may be subject to rotary or reciprocating motion, this is not as severe as the action of centrifugal force on a driving chain. This effect may be most serious in the lubrication of high-speed exposed or semi-closed chains; it is greatest during the period of bending, as the chains pass over the sprockets. At such times any lubricant on the outside surface of a chain may be thrown off, although this depends upon the adhesive ability of the lubricant and the peripheral or surface speed of the sprockets.

All this calls for (1) the selection of a lubricant of adequate viscosity and adhesive ability, commensurate with the manner of housing and method of application, and (2) application of this lubricant over the inner or more active wearing surfaces, in order to insure as complete penetration as possible to the teeth or link connections before the lubricant has a chance to work its way to the outside surfaces from which it may be thrown off.

These considerations apply more strictly to the exposed or semi-enclosed drive, wherein there is but little or no provision for automatic lubrication. Where a driving chain or gear set receives a constant supply of lubricant, as in the timing-gear drive in an automotive engine, or those enclosed industrial chains which are fitted with means for circulation of oil from a base reservoir, maintenance of lubrication is more positive and requires only an adequate supply of properly refined gear lubricant.

Heavy-Duty Bearings

Alignment is most important in heavy-duty bearing operation. Theoretically, line contact prevails in a heavy-duty bearing but actually, however, the potential contact surface for such a bearing is rectangular, though of considerably less area than in a sleeve bearing. This contact, in a roller bearing especially, must be maintained without deviation, for skewing of a roller on a turntable or track roll assembly, for example, may throw the entire bearing out of line, resulting in uneven load distribution and wear. In other words, just as in a well-designed sleeve bearing, the axes of the bearing elements must be in the same plane as the axis of the rotating shaft.

Proper guiding has been found to be the most effective way to keep rollers from skewing; this is a function of the guide flange. As rollers are increased in ratio of length to diameter, guiding may become more difficult. At the same time, while one objective may be attained, the problem is aggravated by the sliding motion which is developed between the ends of the rollers and the end plates or race flanges. Continuous renewal of the lubricating film is necessary to prevent actual steel-to-steel contact at this point.

Function of the Lubricant

The lubricant serves a number of purposes in a heavy-duty bearing: (1) it must protect the component parts of the bearing against corrosion; (2) it must assist the seal in preventing entry of water or dirt, and the resultant abrasive or corrosive effect on the bearing surfaces; (3) it must be a good heat-exchange medium to aid in bearing cooling; and (4) it must function as a lubricant to enable free rolling of the rollers in a roller

(*Continued on next page*)

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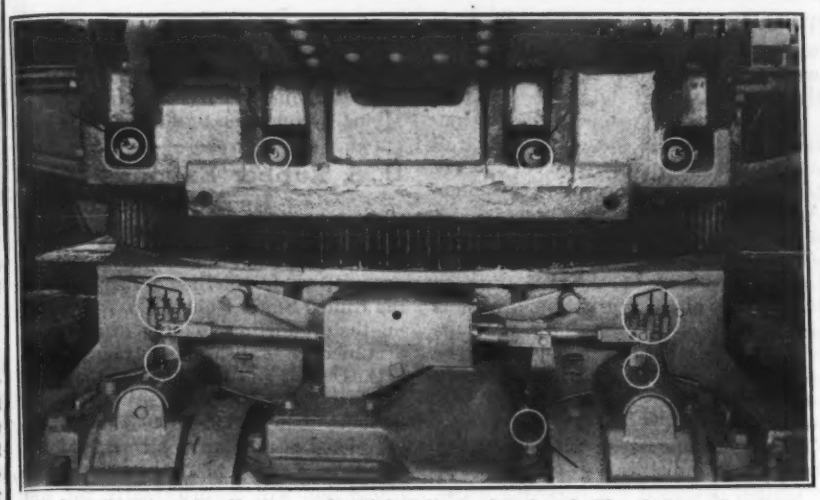

A view directly under the boom of a Link-Belt crawler shovel. The circles and arrows indicate pressure fittings; the lower frame gears are enclosed in substantial housings and run in oil.

Function and Nature Of Good Lubricants

(*Continued from preceding page*)

bearing, and sliding between the rubbing surfaces of the shoulders and rollers.

A lubricant which trains freely with the moving parts at the prevailing operating temperatures meets these requirements most effectually. At the same time, the lubricant must channel sufficiently so that actual churning does not occur. Excessive churning increases the power consumption through internal resistance within the lubricant itself. This frictional effect leads to heat development which may easily build up the bearing temperature beyond the cooling ability of the lubricant; then trouble is impending.

The seal is an important adjunct to cleanliness. If abrasive foreign matter is kept out of the bearing, wear will be reduced, especially if clean dirt-free lubricants are used, and protected from contamination. On the other hand, if abrasive particles are present, rough rolling of the bearing results. When this occurs in a freshly-lubricated element, it signifies abrasion. At first this may be slight, and not noticeable. But abrasion and wear are going on just the same, until, depending upon the amount of dirt, the speed and the size of the bearing, loose rolling or chattering develops. At the same time, the heat at the contact points may be so high as to assist in oxidation-breakdown of the lubricant. Then gums and lacquers may form. Thorough cleaning, drying and relubrication of the bearing parts before wear has occurred to excess is the best preventive against further difficulty.

Nature of the Lubricant

Lubricating oils or greases for heavy-duty bearing service accordingly must possess very definite characteristics. These features must be considered according to the nature of the service, as well as the means provided for relubrication.

Greases suitable for heavy-duty bearings are studied in accordance with the actual lubricating requirements, also with respect to the ability of the lubricating systems to handle the finished grease under the prevailing operating temperatures. In other words, certain definite pressures are available for grease distribution through the lubricating system, according to the design of the pressure pumps.

Accordingly the petroleum refiner begins with a careful selection of the fatty oil and alkali which are used to make the soap base; then a range of straight mineral oil viscosities which are best adapted to the prevailing temperature conditions is selected. All these basic materials must be of a high degree of purity and free from contaminating foreign matter. They must then be combined so that the finished grease will be uniform in composition and texture, resistant to chemical breakdown, not too water-soluble, and structurally capable of being pumped at low temperatures.

Water and heat must always be studied when planning the manufacturing procedure for a grease, since the effect of water upon certain soap stocks, and the viscosity-reducing effect of heat on the viscosity of mineral oils may affect materially the lubricating ability. Lime soap is insoluble in water, so it is widely used where an excess of water may be present. Where soda soap or mixed (lime-soda) base greases are involved, the solubility tendency increases with

(*Concluded on page 69*)

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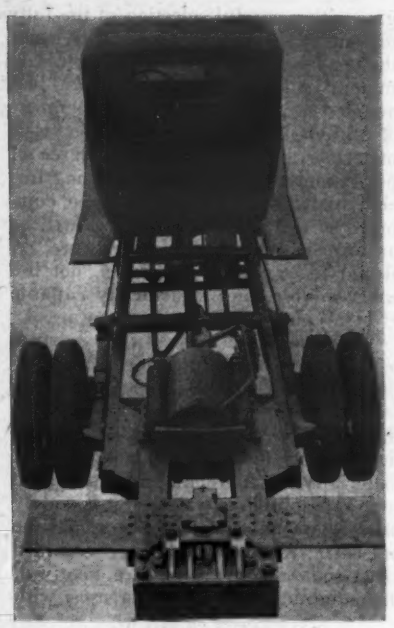

A special truck mounting for the Bros track-pin press.

Track-Pin Presses In Three Mountings

Bros track-pin presses for the repair of crawler tracks are available in three mountings, a stationary press for use in the permanent shops of state and county highway departments, contractors and equipment dealers; a semi-trailer press which is particularly adapted to contractors' use or for service in highway department division shops, as it is readily transported; and a truck-mounted press, supplied on special order, for field work.

The press is 5 feet 8 inches long, 2 feet 3 inches wide without the track guide plate, and the normal operating height of the track platform from the floor is 2 feet 6 inches. The operating parts of the Bros press are a gear pump, a piston valve, and a cylinder of steel with ground and polished bore, fitted with a cast-iron piston and piston rings. The hydraulic lines are all heavy-duty pipe connections made to withstand the low operating pressure of 2,000 pounds. The entire operating control is by a single lever which operates both the balanced valve and the motor switch or throttle control. The full 13-inch stroke takes only 20 seconds when operating against the 100-ton pressure, which has proved ample for the largest tracks. All tracks are worked with the plate side up, and it is unnecessary to remove the track plates except in the cases where the bushings interlock in the track rails.

The stationary press is operated by a 15-hp 220-volt 60-cycle 3-phase squirrel-cage motor directly connected through a chain coupling to the oil pump. The oil supply is carried in the press cylinder and in a supply tank welded to the bottom of the cylinder. Four simple pipe connections with hydraulic companion flanges for convenient assembly connect the entire system. The motor is stopped and started by a push-button switch.

The semi-trailer press consists of the standard press welded into a semi-trailer frame which carries a heavy-duty gasoline power plant, including starter, generator and battery. The frame is carried on long flexible springs, a roller-bearing axle, disk wheels and 7.50 x 16 six-ply balloon tires. In the frame are two large locking tool boxes, one of which contains the battery in an end compartment. Floodlights, which fold down against the frame, are provided and may be adjusted to a convenient height for use. Three stiff legs hold the frame steady in working position, and the roller runways nest together in racks provided for the purpose.

The truck-mounted press can be attached to the rear end of the frame of any truck 1½-ton or larger with a power take-off opening for operating the pump. An anti-friction-bearing power take-off and universal-joint drive shaft are supplied to connect to the pump. Mounting brackets are welded to the press frame to fit the rear of the truck frame. As this press is mounted low in the rear of the truck frame, a platform body can be used above and ahead of it, to carry needed track parts, roller runways, and tools.

Also available is an attachment for general hydraulic press work which was originally designed for removing transmission gears but may be used for anything within its range of 24 inches wide x 34 inches long. The attachment fits any Bros track press, and may be installed in less than 5 minutes.

A 4-page folder describing and illustrating these Bros track-pin presses may be secured by those interested direct from the Wm. Bros Boiler & Mfg. Co., Road Machinery Division, Minneapolis, Minn., by referring to this item.

U. S. Rubber Expands Its Tire Production

To meet increased military requirements and because of the serious shortage of tires for civilian transportation, the United States Rubber Co. is expanding the production facilities of its plants at Chicopee Falls, Mass., Eau Claire, Wis., Detroit and Los Angeles. This expansion program represents an outlay of more than $25,000,000 and will be completed in the latter part of 1944.

It is pointed out that the increased tire production will be principally for war and essential domestic production, and that the present shortage of tires for civilians is likely to continue for several months, necessitating continued conservation of rubber and recapping wherever possible.

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Unusual Overpass On Access Route

Concrete Structure Relieves Maxwell Field Traffic, Has Skew, Curves, Grades and Super-Elevation, No Spiral

✦ A SEVEN-SPAN overpass that "had everything" was recently completed as a relief structure for the new Maxwell Field access road, near Montgomery, Ala. It connects the new dual-lane highway with Day Street, a straight paved thoroughfare leading to the heart of the city. A designer's delight, and a contractor's nightmare, the 292-foot structure carrying a 26-foot roadway is on a 57-degree 48-minute skew, a 4-degree horizontal curve, a 1,000-foot vertical curve, has a 5 per cent grade both ways, a super-elevation of 0.08 per foot, and did have a spiral at one end, but that was eliminated in the field during construction.

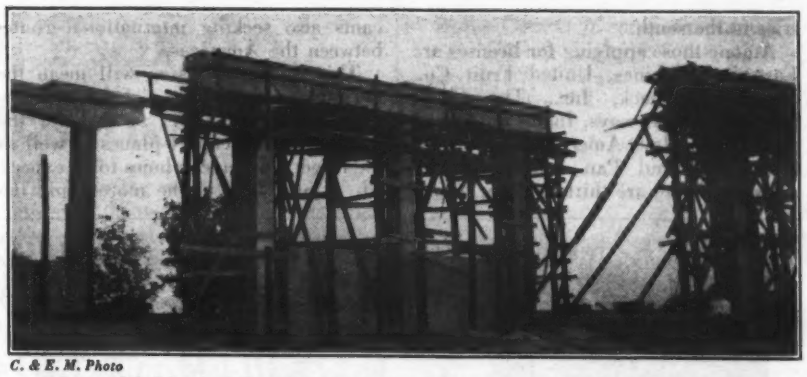
The structure has two open abutments and six 3-column bents carried on 7-foot square footings on a good clay-gravel foundation. The superstructure is a 6-inch reinforced-concrete deck with four concrete girders 3 feet deep and 16¾ inches wide for all spans. Five of the spans are 40 feet and two are 46 feet for an existing track of the Gulf, Mobile & Ohio Railroad and an anticipated second track. The uniformity of the girders for the various spans made for economy in forms and ease in construction and eliminated any change in the caps. The difference in strength is made up in the reinforcing.

All bents consist solely of three 2-foot square columns except the ones on either side of the existing track, which have 10-foot curtain walls. The end bents, or open abutments, have continuous footings 18 x 5 feet x 3 feet deep, and the columns are battered 4 inches per foot on the fill side.

Construction

The column forms were not lined, so that more rubbing was required than is usual when the smoother surface is used inside. All rubbing was done by hand. The columns were poured from the top, a complete pour being 28 feet from the footing to the cap. Flexible chutes were used, and windows were left every 6 feet in the forms for the insertion of a single vibrator in each column.

Concrete was furnished by a local ready-mixed concrete plant in truck mixers, with a haul of about a mile, and was placed by a ½-yard Birmingham bottom-dump bucket handled by a Marion crane with a 50-foot boom. During the pouring of the caps, two vibrators were used, one starting at each end and meeting in the middle.



C. & E. M. Photo

A completed bent of the overpass on the new access road to Maxwell Field, Ala.

The forms for the beam sides and bottoms were of 2 x 8-inch square-end lumber with 2 x 6-inch studs 16 inches on centers, and 2 x 8-inch shiplap lumber for the deck. Native-timber piles were used for the falsework throughout on the job with entire success in spite of their greenness.

The forms were thoroughly oiled with diesel oil before pouring the concrete. This leaves no stains on the concrete and is equally as effective as the heavier oils.

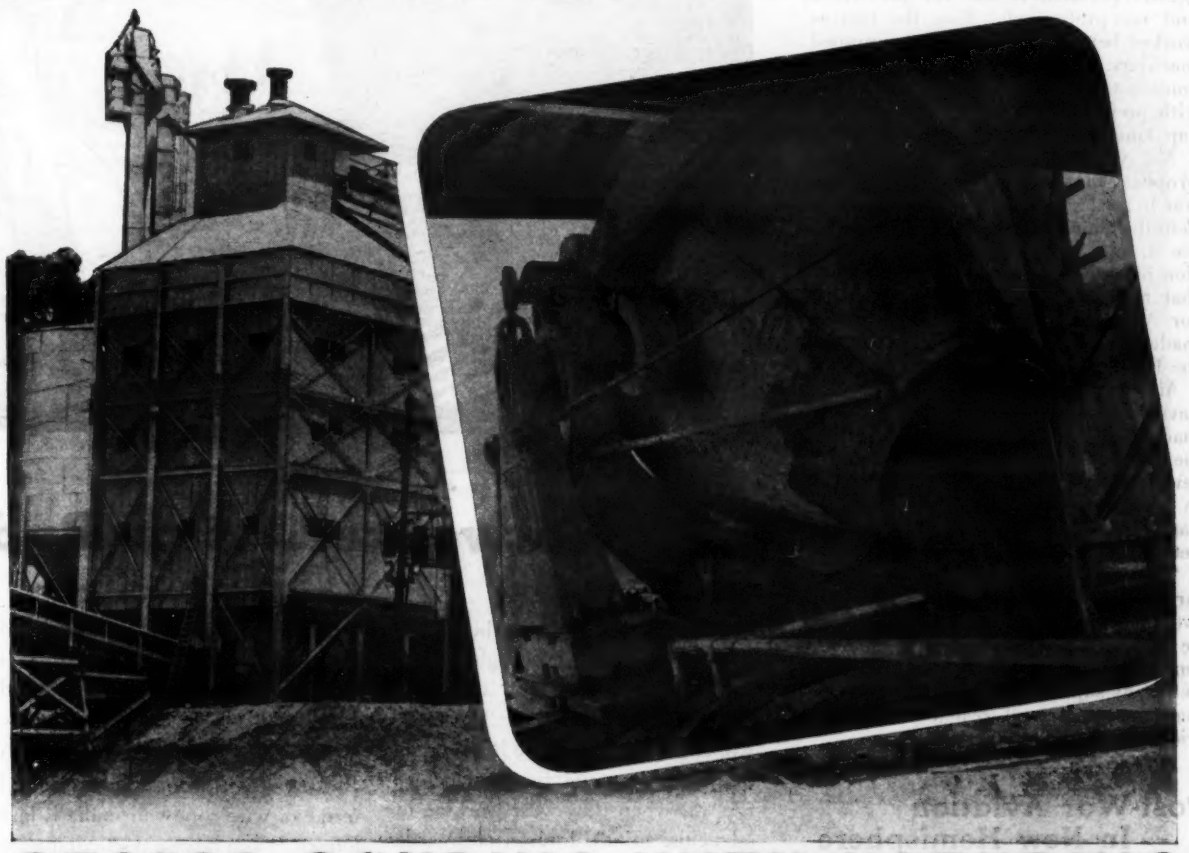
Water for washing out the forms was hauled in a vertical cylindrical tank on a flat-bed truck and pumped up to the job by a small centrifugal pump. The same outfit was used to supply the water for curing the columns, caps, and deck, which were covered with burlap and kept wet for seven days.

Quantities and Personnel

The major quantities for this structure were:

Bridge excavation	525 cu. yds.
Bridge concrete, Class A	791 cu. yds.
Reinforcing steel	175,000 lbs.
Total cost of structure	$43,646.00

This overpass project DA-WC 26-A(1) was built by the Alabama Highway Department by contract with the Milan Construction Co. of Birmingham, Ala., for which C. A. Shepherd was Superintendent. C. C. Clayton was Resident Engineer for the Alabama Highway Department. The structure was designed by Lex S. Owens of the Alabama Highway Department, for which J. W. Chambers is Bridge Engineer.



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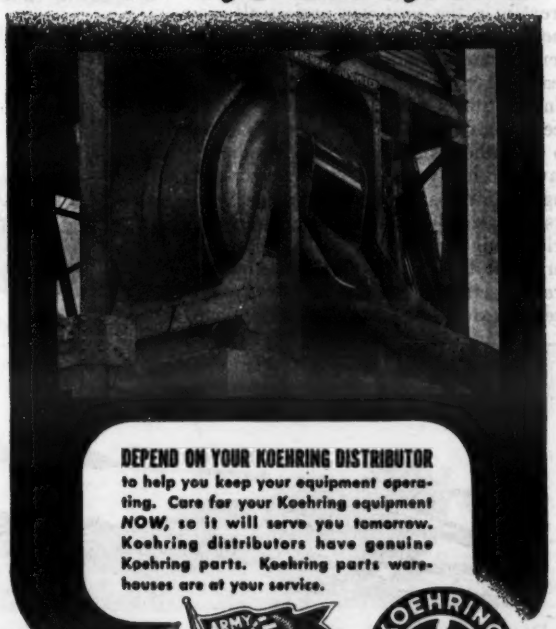

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Dutch Engineer Tells Of Future of Indies

(*Continued from page* 19)

annually washed out by torrential streams and whole sections of roadway carried miles downstream.

The Role of American Equipment

Modern American-made machines have proved to be the answer to tough excavating and road-building jobs, Mr. van de Velde stated. Most of the construction equipment in the Islands before the Jap invasion was modern and included many well-known American-made excavators, cranes, dump trucks, tractors, and dirt-moving scrapers.

"With the arrival of this high-type American-made equipment," Mr. van de Velde said, "came our first experience with preformed-type cable. We soon found that there was no comparison between operation results for preformed and non-preformed. Too, the natives worked better with preformed-equipped machines. I believe that over half our construction machines were equipped with preformed rope at the time of the Jap landings."

Mr. van de Velde wisely refuses to prophesy the date of the final end of the war in the Pacific; he has, however, very definite hopes that he will be there to see it, and to help with the reconstruction job which will follow. He believes that there will be a great opportunity for American engineers and American-made equipment in the Dutch islands of the Pacific as soon as the war is over.

Mr. van de Velde concluded, "We have had experience with American-made machines and we know what they mean in increased work production, in fewer and less dangerous accidents, and in less costly maintenance. Indeed our native workmen have learned to work better with your American equipment.

"As one very small cog in a very large wheel, I can assure you that whatever American equipment is allowed to be relocated or allocated to the Netherlands Indies, and which happens to come under my supervision, will be put to the maximum in use and treated as a needed friend."

Post-War Aviation In New Hemisphere

That commercial aviation for passenger, mail and freight traffic is to expand greatly in the post-war period all over the world is axiomatic. In the western hemisphere, twenty-five companies already have applications on file with the United States Civil Aeronautics Board seeking air routes from the United States to the other Americas. Some applicants have had many years' experience operating steamships to these countries. Others are already in the field of inter-American air transports. Still others are large air transport companies now operating within the United States, which seek to extend their services to the countries to the south.

Among those applying for licenses are Eastern Air Lines, United Fruit Co., Moore-McCormack, Inc., The Grace Line, Braniff Airways, Inc., Pan American Airways, Inc., American Export Airlines, Inc., and Pan American-Grace Airways. There are thirteen other applicants also seeking international routes between the Americas.

This rapid expansion will mean the development of larger airfields and terminals in this country to care for the huge freight transport planes as well as the larger passenger planes to be expected. It may lead to the more rapid development of "free ports of the air" as described in CONTRACTORS AND ENGINEERS MONTHLY, June, 1943, page 2. It will also mean increased construction of larger airfields in the other Americas, much of which may be done by American construction organizations in cooperation with local contractors.

"Hard worker...this Buddy of mine"

When there's a road to be built, or a runway constructed through marshy jungles, important jobs are being done with good, stout Wickwire Rope. In fact, Wickwire Rope was a buddy to many of the men before the war when they were working in oil fields, mines, forests, shipyards and construction jobs.

Seeing that our fighting forces get the wire rope they need is part of our job. Of course, we realize (and they do too), that you also need wire rope to do your bit toward getting supplies to them. It helps speed the day of victory when you make each length you now have last longer.

Proper selection, application and usage of wire rope will make it last longer. If you have a particular wire rope problem we will be happy to be of service. Write Wickwire Spencer Steel Company, 500 Fifth Avenue, New York 18, N. Y.

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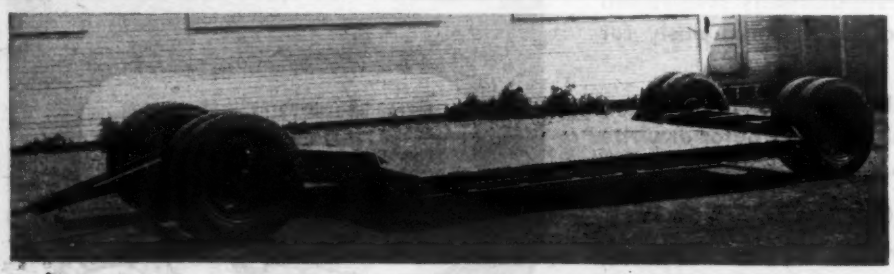

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Dade County, Florida, Watches Maintenance

With Most Heavy Equipment Leased to War Projects, the Care of Roads Becomes the Major County Activity

✦ IT has been the policy of Dade County, Fla., as with most county highway departments, to aid the prosecution of the war in every way possible. As soon as it became apparent that most county road construction would have to cease, the county leased the larger portion of its heavy equipment to contractors working on war projects within the county, subject to repossession by the county for its own use, if necessary, within three days. This foresight of Edmund Friedman, County Engineer, now a Captain in the Engineer Corps, U. S. Army, has been continued by Earle M. Rader, who is holding the interim appointment. The release of county construction equipment did much to aid contractors to speed the work at the great 36th Street Army Air Field at Miami, the county seat of Dade County.

Road Maintenance

Of the 1,000 miles of Dade County roads, 575 miles are surfaced either by oiling, macadam, or concrete, while the balance have all the way from a thin veneer of coral rock to a full-depth base of the same rock. These white-rock roads were bladed regularly to maintain their contour and smoothness until only two patrol graders were left after all others had been leased to contractors, or had minor breaks or needed parts to keep them in service.

The Road Crews

The county is approximately 50 miles from north to south and 36 miles from east to west. Within this area there was formerly a maintenance crew in each of the five commissioner districts, but this has had to be reduced because of the shortage of men and equipment, so that now there are only three hand patching crews operating in the county. These are equipped with a truck carrying sand and an oil tank or kettle with a hand spray. The sand and oil are used for minor patches, while a pre-mix, also carried in the truck, is used to fill pockets and is then surfaced with the sand-oil patch.

With the recent release of more oil for road work, it is expected that it will be possible to increase the number of road repair crews and thus catch up with the ravelling of the white-rock roads under the increased war traffic. Many of these are streets, carrying very heavy traffic, which will rapidly disintegrate unless they are constantly and carefully maintained.

Highway Organization

The Board of Commissioners of Dade County consists of five commissioners elected for 2-year terms from the five election districts. A new law recently passed provides for the election of the commissioners at large from the entire county, beginning at the next election, but each commissioner will represent the district in which he lives. The Board appoints the County Engineer for an indeterminate period, and it is his responsibility to operate the highway department of the county under the direction of the Board, which decides matters of policy.

Each district of Dade County has a shop where minor repairs are made to the road construction and maintenance equipment. There is also one main shop near the center of the county, about 10 miles southwest of Miami, where major overhaul operations are carried on.

The financing of county highway operations is through the 3 cents returned to the counties of Florida from the 6-cent state gas tax. Under this, Dade County received $652,130.83 for the fiscal year which ended September 30, 1943. A recent legislative act reduced this money returned to the counties from 3 cents to 2 cents. In addition, the county assesses a millage tax on real estate, producing a total of $160,000, which is turned over to the cities within the county for the care of city streets which are connecting links in the county highway system.

The method of apportioning the state highway gas tax among the counties in Florida is: one-third on the basis of the gas tax paid by the county; one-third based on the area of the county; and one-third on the basis of population.

Dade County Equipment Roster

The following roster of equipment owned by Dade County also shows those pieces of construction and maintenance equipment which have been leased to contractors and the Army and Navy for construction work within the corporate limits of the county. Asterisks indicate the number of pieces of equipment out on lease, subject to recall for the use of the county on three days' notice.

(*Concluded on page 76*)

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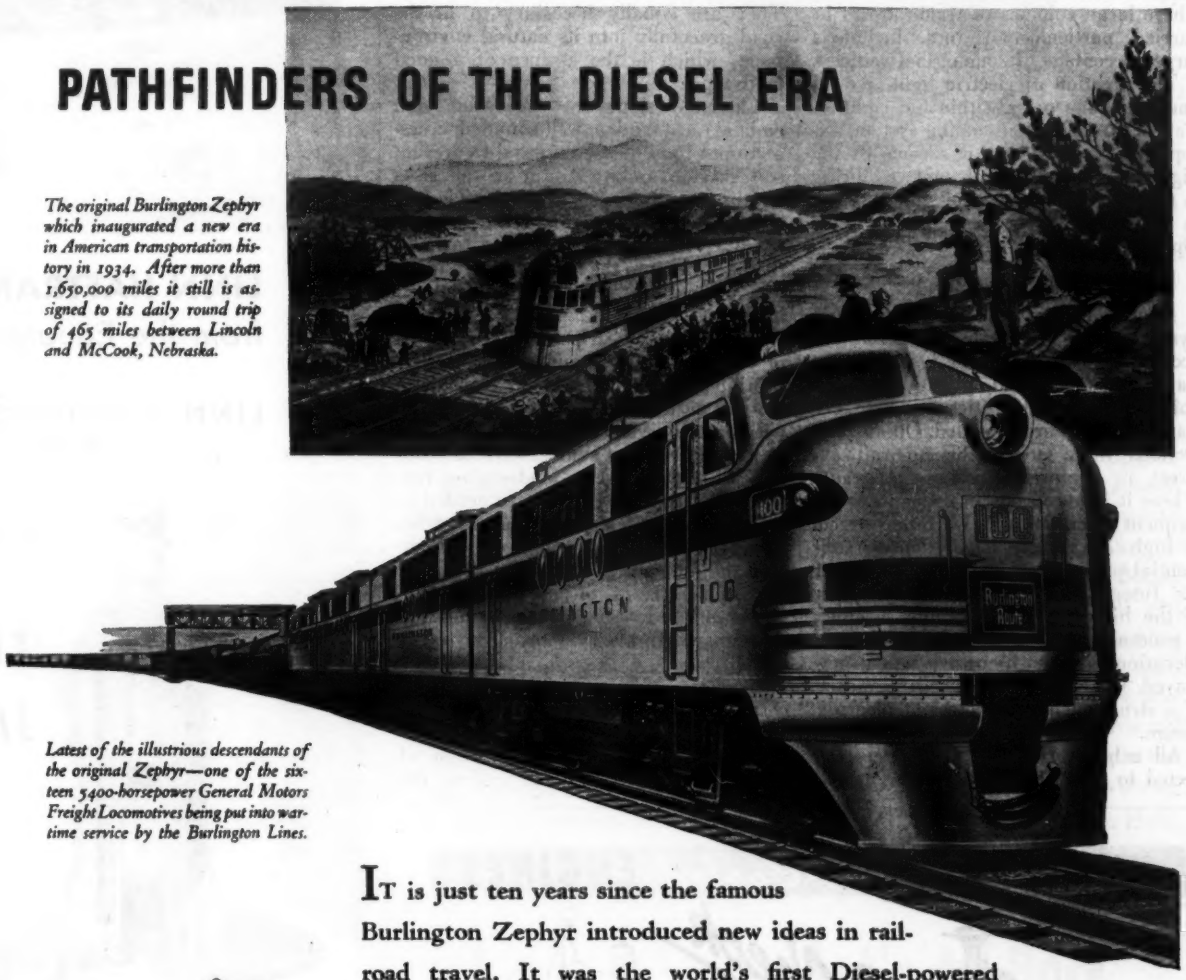
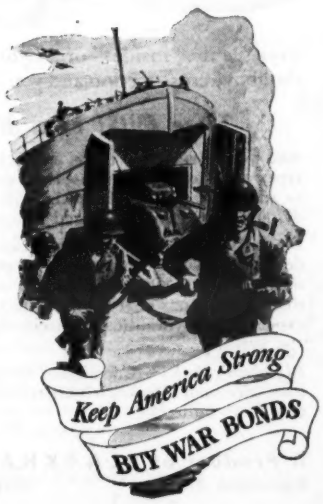


The original Burlington Zephyr which inaugurated a new era in American transportation history in 1934. After more than 1,650,000 miles it still is assigned to its daily round trip of 465 miles between Lincoln and McCook, Nebraska.

Latest of the illustrious descendants of the original Zephyr—one of the sixteen 5400-horsepower General Motors Freight Locomotives being put into wartime service by the Burlington Lines.



IT is just ten years since the famous Burlington Zephyr introduced new ideas in railroad travel. It was the world's first Diesel-powered streamlined train. Its power plant was General Motors Diesel. Today hundreds of General Motors Diesel Locomotives are hauling passengers and freight on 75 American railroads. They operate many millions of miles annually with astounding dependability and economy. Day by day additional GM Locomotives are entering that honored field of more than one million miles of operation. Every day brings new records of performance. And this performance, highlighted by its invaluable contribution to the astonishing war record of the railroads, is providing a glimpse of the greater day of railroading which lies ahead.

GM
GENERAL MOTORS
DIESEL POWER

LOCOMOTIVES . . . . . ELECTRO-MOTIVE DIVISION, La Grange, Ill.

ENGINES . . . 150 to 2000 H.P. . . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

ENGINES . . . 75 to 250 H.P. . . . DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

Safety To Be Planned Into Future Highways

(*Continued from page 45*)

provided wherever the need justifies, and the use of road pavements and shoulders by pedestrians is to be prohibited.

Safety Measures

Several pages are devoted to a careful delineation of the types of sign to be used for directional and warning purposes and to prohibit passing. Center striping on two-lane sections is to be a 4-inch continuous white center line, while 4-inch white dashed lines are to be used on four and six-lane divided sections.

Where merging traffic or an unusual degree of caution is required because of traffic or other conditions on the Interregional Highway, fixed-source lighting is to be provided. It is also suggested that it may be desirable to illuminate rural sections throughout their length where large volumes of traffic are to be carried, particularly if these include a large percentage of commercial vehicles.

The erection of electric light, power, and telephone poles within the right-of-way of rural sections of the system, except those necessary for service of the highway or its appurtenant facilities, is to be discouraged. The same applies to underground electric conduit, water pipes, sewage pipes, etc.

Urban Design

All urban sections of the Interregional System are to be established as limited-access highways, and access to the highway is to be permitted only at designated points at which facilities for safe entrance and exit are provided. On all such sections there are to be no railway, street, or highway crossings at grade. Where it is necessary, in order to avoid frequent intersections with other streets or highways, to elevate or depress substantial continuous lengths of sections of the Interregional Highway, depression of the highway, if financially feasible, is generally to be preferred to elevation. Elevation of the highway, when employed, is to be accomplished by means of a structure of adequate and pleasing design.

All urban sections of the system expected to carry an average daily traffic of 20,000 or more vehicles are to be designed to provide, when it becomes necessary to do so, three lanes for traffic moving in each direction, each lane to have a width of 12 feet; and the lanes for traffic moving in opposite directions should be separated by a raised median strip at least 4 feet wide. Where the average daily traffic is less than 20,000 vehicles, two lanes are to be provided for traffic moving in each direction.

Landscape Design

Highway design, in the broadest sense, rests upon landscape principles as well as upon the more commonly recognized engineering principles of alignment, profile, grade cross-section, roadway and right-of-way width, drainage, and structural strength and durability. A balanced agreement between the two sets of principles characterizes the best design.

Flowing, rather than abrupt, change of gradient and alignment are necessary from the engineering standpoint for promotion of the safety and ease of vehicular movement and for increase in the highway's traffic-discharge capacity. They are equally necessary to fit the road gracefully into its natural environment, which is the essence of a good landscape.

Flattened slopes of excavation and embankment and a well-rounded cross-sectional contour are essential to prevent soil erosion and to minimize the risks of injury and damage when vehicles accidentally or unavoidably leave the roadway. They are needed also to mold the highway into the terrain and to make it a harmonious feature of the natural landscape.

Marginal land strips, publicly owned or controlled, are required for the engineering reason of protection of vehicles moving on the highway against collision with entering vehicles, and of operators of moving vehicles against various roadside distractions. For landscaping reasons, marginal land strips are needed to make possible a pleasing transition between the lines and plantings of the highway and the natural slopes and growth of the adjacent lands, to permit the screening of unsightliness, and to provide stopping space from which to enjoy scenic views.

If engineering principles require a certain monotony of smoothness and attention-lulling security in the roadway design, the appropriate application of landscaping principles can relieve the monotony and promote the safety of traffic by reawakening the interest and attention of drivers.

The Interregional Highway System, in the rural sections especially, will serve a traffic composed in large degree of vehicles driven for pleasure or recreation. Sound landscape design will increase the pleasure and relieve the strain of all journeys. In their urban and suburban sections, the interregional routes will carry a heavy commercial traffic. Adequately landscaped borders will eliminate the traffic hazards of closely crowded buildings, and insulate adjacent residential and business properties, churches and schools from the noise, dust, and fumes of traffic.

Rural Landscape Treatment

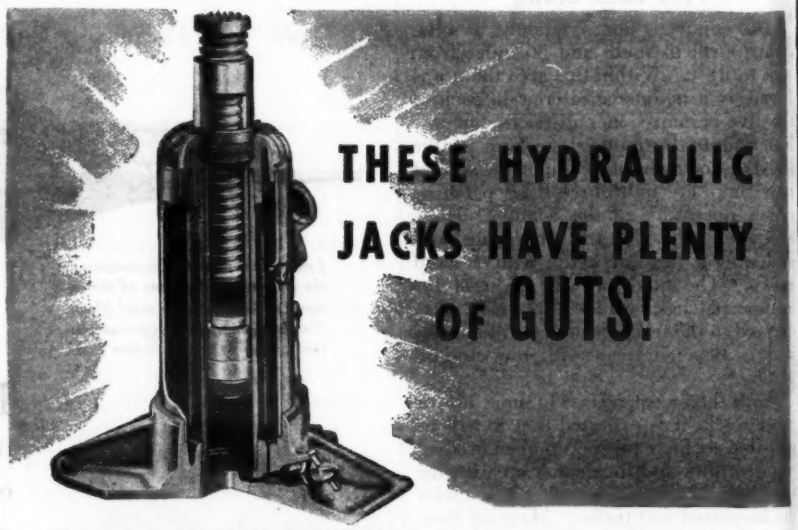
Consideration of landscape desiderata

(*Continued on next page*)

LINN HAFTRAKS show their mettle from the Equator to the Arctic Circle

•

THE LINN MANUFACTURING CORPORATION
MORRIS • NEW YORK



THESE HYDRAULIC JACKS HAVE PLENTY OF GUTS!

Ever see the "insides" of a hydraulic jack? If not—take another look at the above cross-section and you'll come to this very important conclusion:

There MUST be a difference in Hydraulic Jacks!

And you're right — there IS! Each jack manufacturer has a choice of various types of materials for the several dozen parts that go into the jack. And it stands to reason that these materials, will be of varying degrees of quality, workmanship and design efficiency.

Blackhawk Jacks have a reputation for top performance, dependability and freedom from maintenance — and it's that *extra* in quality, design and workmanship that wins this reputation. That's why "Blackhawk" is specified by experienced Hydraulic Jack users throughout construction and industry.

Blackhawk Jacks are available in capacities from 3 to 50 tons. See your Blackhawk Distributor — or write for the new V-43 bulletin.

A Product of **BLACKHAWK MFG. CO.**
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WORLD'S LARGEST MANUFACTURER OF HYDRAULIC JACKS

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Please rush Blackhawk Hydraulic Equipment Bulletin V-43.
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FOR STAMINA AND POWER *on Your Equipment!*

You want horsepower . . . yes. But over and above that you *must* have STAYING POWER. You get both in Wisconsin heavy-duty air-cooled engines. There's plenty of stamina here for slugging away, day in and day out, on those tough jobs that must be licked on schedule. Wisconsin heavy-duty design and construction can "take it".

Most H.P. per pound

WISCONSIN MOTOR Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty, Air-Cooled Engines

Roadside Development Of Interregional Routes

(*Continued from preceding page*)

should pervade all stages of the location, design, and construction of rural sections of the Interregional System, and a proper regard for landscape principles in the design will simplify and increase the effectiveness of maintenance processes and lower the cost of upkeep.

On two-lane sections, the width of roadway and shoulders will be determined by traffic considerations, and the necessity of long sight distance to permit maximum facility of passing will limit the use of curvature for landscape effect. On such sections an ample right-of-way, variously and appropriately treated, can do much to relieve the monotony of driving over long smooth stretches of straight highway, and will contribute largely to the safety as well as the pleasure of travel. Under these conditions the value of land is likely to be relatively low and the need of a reserve of space for future road widening will supplement the requirements of appropriate landscape treatment in support of the economy of a liberal acquisition of right-of-way.

On divided four-lane sections in rural areas, variation of the width of the median strip, a permissible more liberal use of curvature, and separate adjustment of the grades of the divided roadways to the natural slopes of the terrain will add interest to the landscape treatment and often reduce the cost of construction. Where the location lies on the side of the hill or a gentle cross slope, for example, construction cost will usually be substantially lowered by building the separate roadways at different levels, and travelers on both roadways will have an unobstructed view of the countryside. A similar divergence of the alignment of the two roadways to take advantage of natural topographic conditions, such as location on the opposite banks of a stream or on the two sides of a local depression or rock outcropping, will likewise reduce costs and at the same time permit the conservation of interesting features of the natural landscape.

As in the location and construction of the routes, design for utility and economy is found to go hand in hand with sound landscape design, so also a properly landscaped highway will be a highway easy to maintain. The flattened side slopes will favor the growth of vegetation, prevent erosion, and thus remove the cause of much troublesome clogging of the drainage system. The easier slopes can be moved by machine instead of by hand, if they are free of shrub and tree plantings, and the streamlined contours of cut banks will reduce snow drifting and facilitate machine methods of snow removal.

There is no place in sound rural highway landscaping for the regular or row planting of trees. The objective should be the preservation or, where necessary, the re-creation of a natural foreground environment in harmony with the distant view. To that end, existing well-placed and beautiful trees should be preserved wherever possible; unpleasing and view-obstructing growth should be removed; and only where the irregular introduction of trees and other growth will serve to highlight the natural beauty of the roadside view or where it is especially desirable to screen unsightly or distracting objects or activity, without proving a roadside hazard to traffic out of control, should the replanting of trees receive consideration. Trees replanted for such reasons should be native to the environment.

Landscaping Urban Sections

In cities and their nearer suburban areas, the opportunity for employment of the locational devices of landscape treatment will be more limited. But the general straightness of right-of-way alignment, where necessary for avoidance of conflict with the existing street plan, need not confine the roadways of the interregional routes to rigidly

(*Continued on page* 80)

Are you properly emphasizing the SAVINGS FEATURE OF YOUR PLANT'S PAYROLL SAVINGS PLAN?

WITH the war swinging into its tensest phase, now's the time to emphasize over and over again the *savings* feature of your Payroll Savings Plan. To press home to all your people the need of building up their savings—the need of building up their savings not only in wartime but also in the years directly after the war. To point out that a bond cashed before its full maturity is a bond killed before it has given its fullest service to its owner—*or to his country!*

Buying War Bonds, holding War Bonds, and keeping wartime savings mounting—all are absolutely vital. But no one of these is enough by itself. The *savings habit* must be carried over into the years of reconstruction which will follow the war. For if, at war's end, we have 'flash-in-the-pan' spending, *everybody loses.* The spender loses, you lose, and the country loses! While a working public, convinced of the value of continued, planned saving, is the soundest possible foundation for private enterprise of every sort.

We call these bonds War Bonds—and with their aid we will win this war at the earliest possible moment! But they're Peace Bonds, too—and, rightly used, they will win for their holders, *and for all of us,* a happy and prosperous place in the years of peace to come. WAR BONDS to Have and to Hold.

The Treasury Department acknowledges with appreciation the publication of this message by

Contractors and Engineers Monthly

★ Let's All Back
★ the Attack...
★ with War Bonds!

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearings and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

Manufactured by

McCaffrey-Ruddock Tagline Corp.

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Forsythe Equip. Co., Long Island City, N. Y. — Comley Equip. Co., Philadelphia, Pa. — W. E. Phillips, Detroit, Mich. — L. L. Hanson, Chicago, Ill. — Tractor & Mchry. Co., Atlanta, Ga. — Owen Bucket Co., Ltd., Berkeley, Calif. — A. H. Cox & Co., Seattle, Wash.

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Avoid Waste in the
USE OF PAPER!
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To Aid the WAR EFFORT—
☆ Every pound of paper must be used wisely.
☆ We must salvage paper normally thrown into the waste basket.
☆ Avoid waste. Salvage paper for military use.
CALL A COLLECTOR!

Earth Stock Tanks Are Made Watertight

Small Reservoirs Built by Bulldozers And Sealed by Bentonite to Store Water for Cattle in National Forests

✦ OF the many activities performed by the U. S. Forest Service, not the least important is the improvement of forage conditions in our National Forests. Many areas produce cattle feed in varying amounts sufficient for satisfactory grazing if water can be made available for the stock. In some of the forests under the control of the Fifth Regional Office at San Francisco, however, the value of this feed is seriously reduced by lack of water during much of the year, so the Forest Service takes steps to alleviate this deficiency.

In the Modoc National Forest, lying north of Alturas, Calif., the average 12 to 15 inches of precipitation which occurs mostly during the winter months is sufficient to supply the needs of using stock raisers only if it can be stored and made available for use during the remainder of the year when little rainfall can be expected.

Tanks of earth are frequently constructed by bulldozers. From an area approximately 200 feet square, the dirt, to a depth of 10 to 11 feet, is pushed out in opposite directions; then changing the direction of action 90 degrees, the remaining dirt is moved out so that, with the first dirt excavated, pits are formed, surrounded by spoil banks. These are left open at the corners to permit inflow of water at the upstream end and discharge below.

By experiment and investigation, the Forest Service has found that such earth storage tanks can be made water-retentive by the addition of a thin layer of Bentonite to the bottoms and lower sides of the tanks. Deposits of Bentonite, a hydrous silicate of alumina, are available at several points in the Modoc National Forest and are usually to be found in any section having a volcanic history. Bentonite is also available in San Francisco in 100-pound bags at a price varying from $15 to $30 a ton, depending on the grade.

If time permits, crude Bentonite, as excavated, can be hauled to the tank site, spread over the bottom and lower sides quite early in the spring and given the advantage of the long summer in which to weather and air-slack. As excavated, Bentonite is likely to be in large pieces and not as effective as if powdered. If time is limited, water can be applied by artificial means and pulverization obtained by a sheepsfoot roller.

Apparently as little as 1 inch of finely pulverized Bentonite is sufficient as the material absorbs large quantities of water, going into colloidal suspension. Percolating water carries this colloidal jelly into the open pores of the soil, rising with the water level, and forming an effective seal.

Care must be exercised that deposits of diatomaceous earth of similar appearance are not mistaken for Bentonite. This error could easily result from mere visual inspection and before this expedient is used tests should be conducted to ascertain the suitability of the material proposed for use.

This information is based on a report submitted to Anthony P. Dean, Regional Engineer of the Division of Engineering, Region 5, U. S. Forest Service, by C. L. Young, Civil Engineer, who was assisted in his investigations by George James, Forest Engineer, and Floyd Iverson, Range Manager.

New I-H Appointments; Four New Divisions

The election of T. B. Hale and F. W. Jenks as Vice Presidents of the International Harvester Co., Chicago, has been announced, as well as the formation of four new divisions of the company. Mr. Hale, former Domestic Sales Manager, will supervise the operations of a newly designated General Line Sales Department which, under the company's new divisional organization, will handle the sales of all products except motor trucks and industrial power equipment. Mr. Jenks, formerly Manager of the Credit and Collection Department, becomes Vice President of merchandising services and will have supervision over the Credit and Collection and Consumer Relations Department.

The recently formed new divisions are: the Farm Tractor Division, with R. C. Archer, former Director of Domestic and Canadian Sales, as General Manager; the Farm Implement Division, under the managership of R. P. Messenger, former assistant to the Vice President of engineering and prior to that an official of I-H's Australian subsidiary; the Industrial Power Division, with H. T. Reishus, formerly in charge of industrial power equipment sales, as General Manager; and the Fibre and Twine Division, with Neil Loynachan as General Manager.

Three other executive promotions, resulting from the new divisional organization, were also announced. M. J. Graham was promoted from Manager of Manufacturing to Assistant to the Vice President in charge of manufacturing; A. J. Peterson, formerly Assistant Manager of Domestic Sales, becomes Manager of the General Line Sales Department; and F. B. Mattingly becomes Manager of the Credit and Collection Department.

PAY DIRT REMAINS IN THE BUCKET

★ 20% to 40% LIGHTER than other buckets, type for type.
★ 10% to 14% MANGANESE steel chains and fittings.
★ Perfect distribution of weight provides greater ease of handling.
★ ALL-WELDED construction ... no rivets to work loose.

THE ROUND *Perforations* ARE AN EXCLUSIVE FEATURE

Get bigger payloads in wet digging with a Hendrix Lightweight. The perforations let the water run through, and provide a capacity load each trip. Their round design eliminates breaks which occur regularly in buckets perforated with square holes or made with lattice pattern.

AVAILABLE in 3 TYPES: ⅜ to 20 yards. With or without perforations. Write today for specifications, descriptive literature and prices.

HENDRIX Lightweight DRAGLINE BUCKETS

DESOTO FOUNDRY, INC. • MANSFIELD, LOUISIANA

FIELD LUBRICATION
Life-Giving Plasma
FOR EQUIPMENT

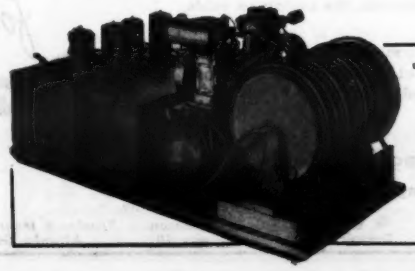
Correct lubrication prolongs the life of valuable equipment — Keeps it fit and fighting — working more hours, more efficiently. And the best way to assure correct lubrication is with a Graco Convoy luber.

This portable, self-contained, field lubricating unit brings the lubricant to the equipment. Its heavy duty pumps dispense track, gear, chassis and hypoid lube at high speeds through 30 foot hoses. Valuable and hard-to-get tires are serviced with a 50 foot air line. Essential hand guns, tools and accessories are carried in convenient drawers. The Graco Convoy luber is a complete service department on wheels—always ready for action.

A Graco Convoy luber is your assurance that your equipment will get the right grease, at the right time, properly applied.

Get the details on the saving of high pressure field lubrication. Write or wire for Catalog No. 137 for complete information. Graco representatives serve all territories.

GRAY COMPANY, INC., Minneapolis, Minnesota



GRACO
GRACO CONVOY LUBERS

Getting Best Results From Membrane Cure

Although membrane curing of concrete has been used extensively for the past decade, during the past three years, under the pressure of wartime construction, this method of concrete curing has been an innovation to many contractors. Membrane curing, which is an alternate curing method accepted by the U. S. Engineers, Bureau of Yards and Docks of the Navy, Civil Aeronautics Authority, Defense Plant Corp., and numerous other Federal and state highway departments, is used for curing the concrete in highways, runways, revetments, igloos, floor areas, vertical surfaces, walls, bridges, bulkheads, and similar structures.

Concrete curing is an important function today, both from the aspect of results and of costs. On all large projects requiring concrete curing materials, some type of power spray equipment, usually powered by a gasoline-driven engine, is used. According to E. J. Savage, Chief Engineer, Thompson Materials Corp., 204 West St., New York 13, N. Y., the following elementary procedure guarantees the best results from the use of membrane curing compounds:

1. Pick the operator for your spray machine with care. One day's instruction in proper application methods can assure properly cured concrete and save money in curing costs.

2. The spraying of the concrete should follow immediately after the finishing operations. If applied in accordance with instructions, the material performs as it is designed to, providing a membraneous film over the unset concrete. If applied hours later, the contractor runs the chance of hair cracks and checking, due to moisture loss in the top surface of the slab.

3. The spray bar should never be held more than 18 inches from the surface to be cured. This eliminates waste and assures an even film. When the spray bar is held too far away, there is considerable loss of material as it is atomized in a fine fan-shaped spray which even a slight breeze will blow away.

4. Nozzles and spray heads should be thoroughly cleaned after each day's operation. To assure proper functioning of the spray machine, all nozzles should also be placed in a solvent overnight to prevent the membrane film from sticking. Spray bars and hose should be blown out.

5. The nozzle of the spray equipment is designed to provide a fan spray calibrated to give the proper coverage for curing. Do not change the nozzles, as too little material results in improperly cured concrete, and too much material in additional and unnecessary curing costs.

Will Post-War Roads Be Much Different?

Because certain materials became critical at the very start of war construction, many of our access roads and airport runways have been built of somewhat different design and by slightly different methods than would have been used in pre-war years. Just how many of these methods and materials will be incorporated into our post-war construction has been the cause of many discussions. Recently, following a group discussion of this very subject, the following ideas were expressed by the majority of the design engineers present.

Reinforcing will most certainly reappear in all concrete paving where the expected loads warrant, but there will be certain secondary uses where the continuance of the thicker concrete paving without reinforcing will be found to be more economical. Along the same lines, the engineers feel that the uniform-thickness pavement has proved its case and will generally be accepted in post-war design, rather than the thickened edge which was so dominant for many years following the Bates road tests. There will be a greater use of Vinsol-treated-resin cements in post-war roads.

In the design of pavements for high speeds the lanes will probably be 12 feet wide while the same width will be used for truck lanes and the 11-foot width will replace the old 9 and 10-foot widths for most highways.

The greater use of the insulation layer beneath concrete and black-top construction is assured. In fact, one state reported that it had used a 3-inch granular layer under all concrete construction for a period of 7 years and has not had a single case of "pumping".

Flatweave Rope Slings For Easy, Safe Loading

A folder has just been released by John A. Roebling's Sons Co., featuring its Flatweave flexible wire-rope slings. Flatweave consists of six separate ropes so woven as to achieve a flat bearing surface which distributes weight evenly, thus prolonging the useful life of the sling and promoting safety and ease in lifting loads. Another feature of Flatweave wire-rope slings is that they are free of unwieldy fittings, and can be slipped under or through a load with a minimum of clearance.

A copy of the folder containing further details on these slings may be secured by request to John A. Roebling's Sons Co., Trenton, N. J., and mention of this item.

. . . Out of Reach . Out of Luck . . .

'GOOD roads are as beneficial to the farmer in a business sense as they are to the motorist in a pleasure sense. Almost any rural ...munity that will plan ahead can ... the right T...ia roads as ...ements.

TIMES HAVE CHANGED BUT NOT THE STORY

In 1930, Barrett published this advertisement championing the cause of the farmer. Yet, despite fourteen years of unprecedented road-building activity, Pearl Harbor found this country with 1,474,445 miles of roads still unsurfaced. This means that in the present crucial war period thousands of people are being denied quick and easy access to major traffic routes.

Actually, all over the country, the plight of the farmer "out of reach and out of luck" is more difficult than ever before. Today, under the stress of accelerated use and unavoidable wartime neglect, even the surfaced "feeder" roads are wearing out and breaking down.

In fact, the problem of secondary roads is one which far-seeing highway officials realize must be dealt with *first* in post-war planning.

Barrett Tarvia is a prime factor in these plans. This famous basic road-building and maintenance material has already proved its practical value to tax-conscious communities in making possible economical construction by local labor — using local materials. The Tarvia field man will gladly give you full details, help you with the development of your post-war program.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

New York . . Chicago . . Birmingham . . St. Louis . . Detroit . . Philadelphia . . Boston
Providence . . Rochester . . Minneapolis . . Cleveland . . Columbus . . Toledo . . Youngstown
Syracuse . . Buffalo . . Cincinnati . . Bethlehem . . Portland, Me. . . Bangor, Me.
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Barrett Tarvia*
*Trade-mark Reg. U.S. Pat. Off.

Contractors Urged To Plan for Future

(*Continued from page 57*)

costs, and this trend will continue until after the close of the war. There will then be necessary at once a large program of betterment and heavy maintenance as distinguished from replacements of deteriorated highways by new construction.

For the first time on any large scale, engineering funds for detailed plans have been made available from Federal sources to be matched by state funds prior to the time that construction funds have been appropriated. The importance of this policy can hardly be over-estimated. It represents a maturity of public thinking. In the past, the failure to provide engineering funds for advance planning has generated wholly unnecessary inefficiencies and extravagances. Engineers have continuously worked under pressure to get construction under way after construction funds were provided, and at best have had to carry, at least within themselves, the chagrin of having failed, through lack of time, to produce the perfection of plans and specifications of which they are capable. This condition has reacted adversely upon the construction industry. A sane public policy in the letting of contracts demands that the element of uncertainty and risk be eliminated from the plans for the products which the contractors covenant to produce. The preservation of fair competition between contractors depends upon the completeness and accuracy of the plans upon which they make their bid prices.

Contract Plans Essential

A canvass of the state highway departments, as reported on December 1, 1943, indicates that about $170,000,000 of work could be advertised for Federal-Aid and state projects, which could be increased by $190,000,000 in 60 days, and by $373,000,000 in six months. This does not represent the extent of plan preparation, but includes those projects for which right-of-way will also be available. This latter item merits further comment. While the volume of ready post-war plans is as yet inadequate, there is reason for considerable gratification that, for the first time in the history of highway operations, so large a program is prepared in anticipation, but before the availability, of construction funds.

The location and types of highway construction to be undertaken have a material bearing upon the organization, plant and equipment required by the contractors. This war has given an opportunity to examine closely the inadequacies of highway improvement undertaken since World War I. The state highway planning surveys, the studies leading to the report of the National Interregional Highway Committee, the realization that the traffic problem has shifted from the rural road to the gates of the cities and through their very heart, are but a few of the lessons that have been learned concerning the inadequacies of our present highway system.

State Legislation Required

All of these facts are an attempt to establish a reasonable basis, within the limits of our present knowledge, for the construction industry to make an inventory as to its preparedness for a post-war program. It is an expression of faith based on a long experience with state and Federal legislative bodies that inevitably legislation is enacted when convincing information is presented.

In closing, Mr. MacDonald urged the members of the Associated General Contractors of America, through their chapters and branches, to present to their state legislatures, just that information which is required to stimulate adequate and proper legislation for planning and financing the system of highways we must have in the post-war era, and that similar cooperation with other highway bodies result in the presentation of data to the committees of the Congress that are now studying the highway needs of the nation.

Indiana Man-Power Losses

The Maintenance Division of the State Highway Commission of Indiana has had a heavy turnover of employees. Of six district clerks it was found necessary to replace three. Of thirty-six sub-district clerks, twenty-six left either for the Army or for war plants. They lost 266 out of 474 patrolmen and of the thirty-six sign men twenty-four left the service of the state. Among the machinery men lost by the state were shovel operators, center-line markers and Mud-Jack operators. Foremen leaving included both maintenance and shop men.

New Docking Facilities For La Guaira, Venezuela

The Ministry of Public Works of Venezuela has announced that a contract has been let to Raymond Concrete Pile Co., New York City, for the construction of a reinforced-concrete steamship pier and yacht basin at the Atlantic port of La Guaira. The pier will be 1,070 feet long and 236 feet wide and will take about 18 months to complete. The construction of this pier, warehouses and other installations will provide trans-Atlantic ships with new and modern Venezuelan docking facilities.

BLOCK BUSTER

Highways are "War-Ways" . . . . they must be maintained! To insure the confined flow of armaments to the Fighting-Fronts, the highways on the Home-Front must have high-speed repairs.

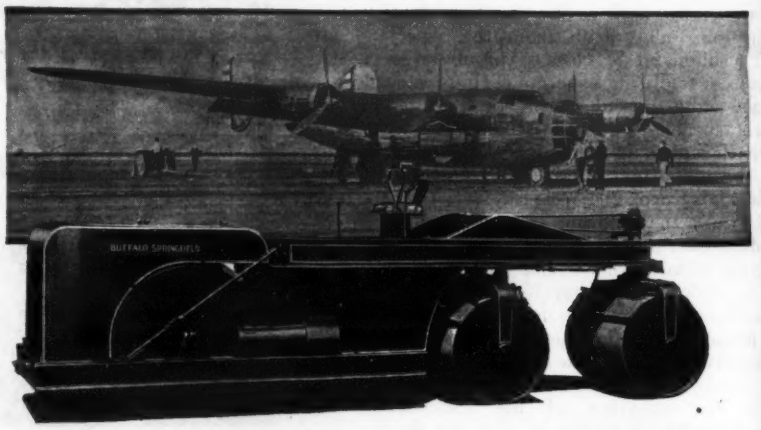
The Novo Pavement Breaker is ideal for breaking cement to repair bridge approaches and flooring, air-port runways, floors in industrial plants, and cutting trenches in cement and frozen ground. It's accurate for "spot-patching" and fast for "straight-away-repairing." It combines mobility for maintenance of continuous traffic and controllability for protection of underground installations. The Novo Pavement Breaker can easily be installed on a used-truck, and the moderate initial and low operating costs insure profit in your job.

For fast demolition of pavement in need of repair, get a Novo Pavement Breaker . . . . it's a real "Block Buster."

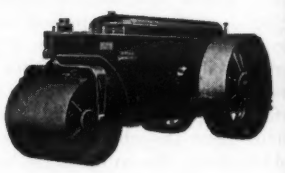
Give yourself a "break" on your pavement breaking job.

Also a member of A.E.D.

NOVO ENGINE COMPANY LANSING, MICHIGAN



VICTORY *in* 1944?



With American made construction machinery leveling mountainside and jungle ahead of our bombers and those bombers leveling the enemy at every contact, victory will, in due course, be ours.

The Buffalo-Springfield organization is proud of the contribution its product is making in the service of our country.

THE BUFFALO-SPRINGFIELD ROLLER COMPANY
SPRINGFIELD, OHIO

BUFFALO-SPRINGFIELD ROLLERS

WELLMAN WILLIAMS TYPE BUCKETS

BUCKET QUALITY BACKED BY TWO FAMOUS NAMES

Williams Buckets have been famous for nearly 40 years for their many mechanical features.
Since 1931, Williams Buckets have been built by Wellman, known for many great engineering achievements in the heavy iron-ore, coal, and steel industries. The welded construction which featured Wellman custom-built buckets for extra heavy steel mill service, is now used in all

Wellman-Williams Buckets For Longer Service With Less Maintenance Cost — Built in Multiple Rope, Power Arm, and Power Wheel Types in ⅜ yd. to 16½ yd. capacities.

The Wellman Engineering Company
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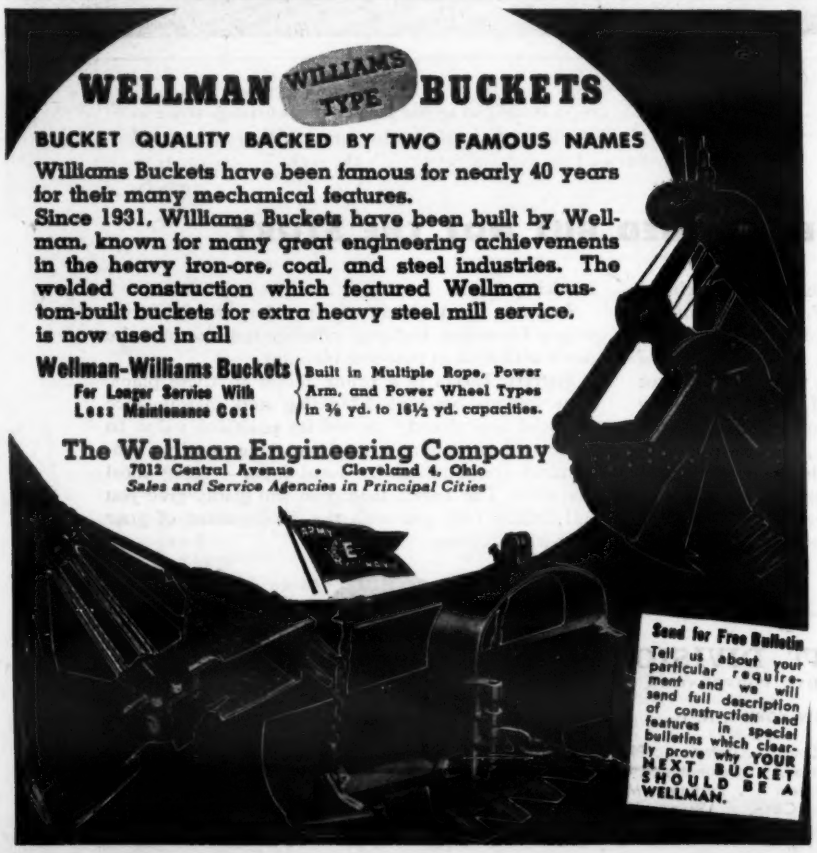


Send for Free Bulletin
Tell us about your particular requirement and we will send full description of construction and features in special bulletins which clearly prove why YOUR NEXT BUCKET SHOULD BE A WELLMAN.

Choosing Lubricants For Better Results

(*Continued from page 59*)

the temperature of the water.

Methods of Lubrication

Pressure grease lubrication by positive delivery of measured quantities of grease at periodic intervals is customary on mobile construction machinery, such as tractors, excavators, rollers, and mixers and pavers. This lubricating equipment, which includes grease guns, has been specifically designed to prevent entry of non-lubricating foreign matter to assure economy of lubricants and to reduce hazards in handling, filling and control.

Conclusion

Construction machinery is subject to the most severe service and operates under most difficult and injurious conditions. Exposure to the weather and frequent contact with mud, dust, abrasive and corrosive materials cause depreciation of the working parts which is often far above normal. To counteract the injurious effects of such exposure, machinery of this type is rigid and sturdy in design and construction, but regardless of the mechanical features, wear will occur relatively rapidly unless lubrication is effectually maintained. Therefore, lubrication in the field of construction is a paramount feature in the care of equipment if cylinders and bearings are to resist scoring in the event of the entry of abrasive particles of foreign matter; if gears are to operate properly without abnormal wear in the presence of corrosive fumes or dust; and if wire ropes and chains are to function safely day after day without the possibility of broken or rusted strands or links.

Lubrication, of course, must be studied with due regard for the exposed conditions under which construction and highway-maintenance machines operate. Protection of lubricants under such conditions is as important as protection of the working parts. It is imperative that they be capable of functioning effectively regardless of weather and temperature fluctuation. The probability of water being present in sufficient quantity on the average construction job to reach certain of the moving parts of some machines requires full appreciation of the detrimental effects which may result from immersion.

Copies of the March issue of *Lubrication* containing the article on construction machinery and its lubrication, from which this article was prepared, may be secured by those interested direct from The Texas Co., 135 E. 42nd St., New York 17, N. Y., by mentioning this magazine.

A Second Burma Road

For almost two years the U. S. Army Engineers, under the direction of Col. John Arrowsmith, have been hacking and hewing a new supply route from India into Burma. It is known as the Ledo Road, and the difficult way lies through jungle-choked terrain and over flood rivers and chasms in the foothills of the Himalayas. In many places it has been necessary to blast the road out of hillsides. Running in an easterly direction along the southern slopes of the mountains in India until it reaches the Burma boundary, the American road turns southeast toward the upper Chindwia River area—a strategic course which may well contribute greatly toward dislodging the Japs from North Burma. When that desirable feat has been accomplished, it is anticipated that the new road will connect with the famous Burma Road, to facilitate sending supplies into China by land.

Construction of the Ledo Road is another heartening example of cooperation against the common enemy. Although most of the engineering troops engaged in this work are American, white and negro, their numbers are supplemented by Chinese and Nepalese Kachin tribesmen, Naga headhunters and Indians working as laborers. A force of Kachin tribesmen, led by an Englishman and including American junior officers and enlisted men, act as scouts in this dangerous and unpredictable country, and the project is protected from Jap snipers by Chinese forces.

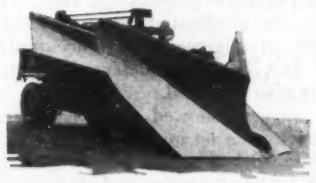
This striking example of roads as weapons, from Allied Headquarters in Burma, was reported by Charles M. Upham, Engineer-Director of the American Road Builders' Association, in a recent issue of "Down the Road".

Salvaging Cast Iron By Electric Arc Welding

A brochure just received from C. E. Phillips & Co., of Detroit, Mich., clears up much of the prevalent confusion on the subject of repairing iron castings by electric arc welding, and makes a valuable contribution to the cause of metal conservation. While it is conceded that welding cast iron is a somewhat difficult procedure which has been only indifferently successful in the past, it is pointed out that success depends upon selection of specially developed welding materials. Four types of electrodes for use on cast iron are described and the characteristics and best welding procedures for each are explained, with particular emphasis on the requirements of the finished job. Phillips "600" nonferrous electrode, for instance, is said to produce deposits the color of cast iron, which can be machined through the line of fusion.

Copies of this brochure may be secured without cost upon application to C. E. Phillips & Co., 2750 Poplar St., Detroit 8, Mich. When making this request, please mention CONTRACTORS AND ENGINEERS MONTHLY.

Foresight Pays DIVIDENDS



—MANY DAVENPORT-FRINK SNO-PLOWS

—performed their snow clearing functions without a hitch last winter BECAUSE their owners anticipated their repair needs EARLY and were READY when the snows came. We suggest equal foresight for next winter. It will be a pleasure to supply the Sno-Plow repair parts you will need for top efficiency.

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Made in Eastern U.S.A. by CARL H. FRINK, 1000 Islands, CLAYTON, NEW YORK

Repair shop five miles above Berlin!

There's a burst of flak . . . and suddenly your communication system goes dead! What's wrong . . . where's the damage? Your life may depend on how fast you fix it.

That's where electrical indicating instruments come in! They're wired to 54 different parts of the communication system . . . they spot the damage instantly . . . save vital seconds in repair work.

Today we at Gruen have turned our 70 years experience with *Precision* Watches to the job of making these precision instruments for war.

Should you be unable to obtain the particular Gruen model you want, we know you will understand.

Remember those repair men in the skies over Europe . . . the men whose needs come first.

The Gruen Watch Company, Time Hill, Cincinnati, Ohio, U.S.A.
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GRUEN . . . MAKERS OF THE PRECISION WATCH . . . AND PRECISION INSTRUMENTS FOR WAR

BUY A GRUEN WATCH . . . BUT BUY A WAR BOND FIRST!

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AMERICA'S CHOICE SINCE 1874

APWA at Hearing On Post-War Plans

A recent issue of the *News Letter* published by the American Public Works Association recapitulates the data on post-war planning presented by the association to the House Committee on Public Buildings and Grounds, which is conducting a series of hearings on post-war policies under the chairmanship of Congressman Fritz Lanham. These data, based on reports from 68 representative cities ranging from 2,700 to 674,000 population, indicate that 76.5 per cent of the communities will need additional funds for post-war planning, and 75 per cent need additional engineering personnel for this work. To the question of whether local advance plan preparation could be furthered by Federal assistance, 67.8 answered in the affirmative without qualification, and 23.6 answered "no".

The feeling in cities in New York was that local planning had been stimulated by the granting of state funds, on a matching basis. In Binghamton, for example, where projects amounting to $1,205,000 have already been approved by the New York State Post-War Public Works Planning Commission, the state has advanced ½ per cent of this amount for preliminary plans, and, if these plans are approved, 1½ per cent will be provided from state funds for final plans.

All 68 cities stated that, given sufficient funds and adequate staffs, $173,000,000 in capital improvements (streets and bridges, sewerage and water supply, public buildings, refuse facilities, airports and similar projects) would be designed in 1944, an approximate ratio of $28,600 per 1,000 population. These figures are not predicated on any outside financing arrangements. An accumulation of $19,733,975 in deferred maintenance is also reported.

The survey showed that contracts could have been let on January 1, 1944, for public works projects valued at $48,124,371 by the 68 cities included in the study. Analysis of these figures on public works construction ready for the contractor shows that for every $1,000,000 worth, $3,000,000 is under survey and $9,000,000 is being given preliminary study. Using the survey figures as a basis, the Lanham Committee estimates that in cities under 1,000,000 population, capital improvements valued at $550,000,000 were ready for contract on January 1, 1944; that $1,600,000,000 of work was under survey or on the drafting board; and a total of $3,780,000,000 of public improvements were being given preliminary study. It was further estimated that an additional $1,500,000,000 in public works could be provided by the nation's five largest cities.

Eastern Representative Of Wisconsin Motors Dies

Arthur H. Quade, formerly of Oshkosh, Wis., and for the past seven years eastern representative of Wisconsin Motors in New York City, died on February 20, at the age of 39. Mr. Quade was well known in the construction and marine fields for his knowledge of engines and, although during the past two years he was primarily occupied in Government work, he continued his interest in civilian equipment and wartime servicing problems.

kept FORM costs down!

RICHMOND 10-WAY SAVING PLAN

1—Provides all kinds of form-tying devices to choose from.
2—Economizes because Form Ties cost less to use than wire, band or rod ties.
3—Supplies Form Ties engineered for safe working loads of 1,500 30,000 lbs.
4—Assures faster erecting and stripping plus big lumber savings.
5—Promotes perfect alignment for correct wall thickness.
6—Protects job against rust staining with 1 to 3 inch cutback.
7—Saves shipping and handling costs because of scientifically reduced weight.
8—Is only known prevention against termite destruction.
9—Enables you to borrow working parts and to pay only for ties in the job.
10—Is planned from job plans to use the right size of ties and the least number of ties to fit forming for fast, safe work.

SEE OUR CATALOG IN SWEET'S

Whether you are planning, designing or estimating on a concrete job—large or small—there are *Dollars* to be saved on *Form Work* by planning.

Richmond Services to Architects, Engineers and Contractors include recommendations on Form Tying Devices, Consultation on Form problems and Forming used, as well as Estimates on requirements, all without obligation.

The list of big jobs on which Richmond Form Ties have saved on form-work costs and speeded up completion is a blue-ribbon list of modern construction. It includes mammoth projects everywhere—and small contracts, too. There is a Richmond Tie engineered for every type of concrete construction. We plan a Tie to fit the work.

For information, write to our Planning Division.

RICHMOND SCREW ANCHOR COMPANY, INC.
215 LIBERTY AVENUE • BROOKLYN NEW YORK
Established 1911

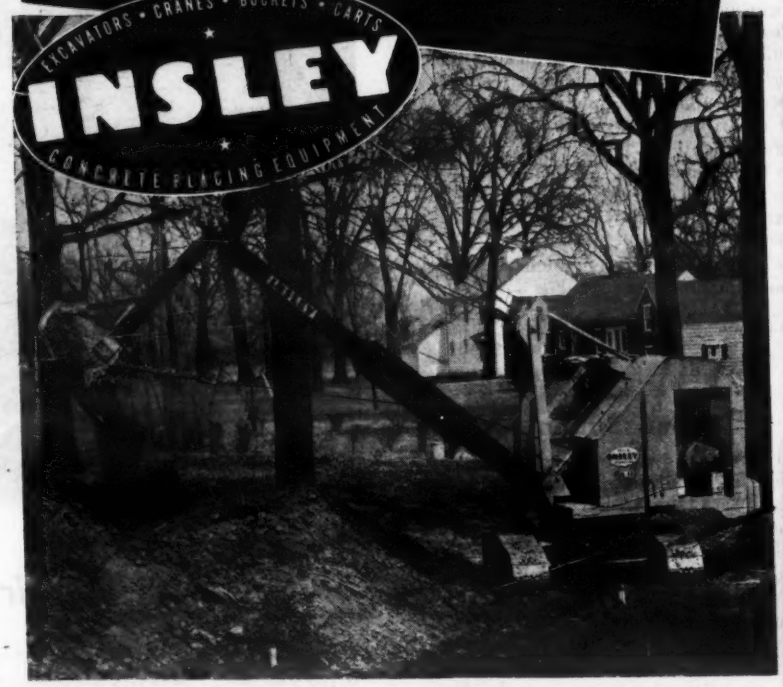
Faster on and off the job

On the fighting front—where time saved may mean lives saved—the Insley Excavator's mobility, speed and ability to work at top efficiency in cramped quarters mean getting to the job and getting it done—*faster!*

Tomorrow—when time will mean the difference between profit and loss on your jobs—you'll find that this same mobility, speed and knack for working in the tight spots will get you on the job and OFF the job—*faster!*

INSLEY MANUFACTURING CORPORATION
INDIANAPOLIS 1, INDIANA

EXCAVATORS • CRANES • BUCKETS • CARTS
INSLEY
CONCRETE PLACING EQUIPMENT



For the duration, ⅜ – ½ yd. Insley Excavators will not be available. Concrete and readymix buckets can be supplied.

☆ Buy A Share In America ☆

Lend a HELPING HAND with your WAR BONDS

A Banker Analyzes Financing of Future

(*Continued from page 22*)

mortgage credits. The first is that each project must be submitted to the closest scrutiny to ascertain the likelihood that the debt service can be paid out of the proceeds of the operation of the property. The promiscuous and unstudied credit represented by mortgage bond issues during the 20's should never again be tolerated. Surely we have learned much in the past two decades about the adjustment of mortgage credit to the character of the project and its earning expectancy, upon which credit must be based. The sound development of our real-estate inventory gives wide scope for the employment of the facilities and enterprise of the contracting industry; we need not have resort to the unsound credit that leads to inevitable collapse.

The challenge to the imagination of both the builder and the lending institution is in the appraisal of the economic soundness of the proposed construction. All too frequently in the past both parties have been too rigid in following established patterns, and have judged the market solely by past performance. The energy that has been spent in convincing the construction industry and lending institutions of the soundness of residential construction in lower price ranges is witness to the rigidity with which established thought patterns persist.

The extent to which leading general contractors have become engaged in housing developments in recent years is one of the most encouraging signs in the housing field. Unless private enterprise is willing to abdicate and become neither private nor enterprise, there must be both contractors and lenders who are willing to experiment with novel and unfamiliar projects. The fact that "it has never been done before" must not stand in the way of logical and intelligent experimentation.

Mortgage and Equity

The crux of the whole problem is found, however, in the financing of the equity. It is not my purpose here to attempt to draw a fine line of demarcation between funds for financing the equity and funds for financing the mortgage. There is, however, one distinction of importance. Equity funds are characterized by their sharing in profits and absorbing losses. Mortgage funds for the most part are trusteed or fiduciary funds. They cannot be expected to stand exposed to the risks of market fluctuations as do equity funds. This principle pervades all types of financing, whether it be corporate, personal, or fiduciary. It is unwise financial management when equity funds are so limited as to indicate exposure of borrowed funds to market fluctuations. This situation is as unwise and undesirable for the borrower as for the lender. It can result in total loss of the equity as well as annoyance and loss on borrowed funds.

Thus taking a protected position, mortgage loans should not be extended unless nor until equity funds are committed in sufficient volume to protect the mortgage funds. Mortgage funds may thus be superabundant and construction at a standstill because of the absence of equity funds.

An abundance of funds for equity can be expected only if conditions are such as to induce owners of bank deposits, money in circulation, and other resources to risk these resources in equities. One of those inducements is the opportunity for profit. Equity funds for investment in private construction projects must be encouraged if we are to expect any considerable volume of private construction after the war.

Spending vs. Conservation

Investment in both equity and mortgage indebtedness is a long-term investment. For the present time, most of the current income available for investment is being placed in government bonds. This is as it should be and must be for the achievement of the victory upon which all else depends. Once that victory is achieved, much of the incentive for saving or for placing funds in long-term investments will have disappeared. If the purchasing power represented by cash and redeemable government bonds in the hands of individuals, corporations, and partnerships should seek to be converted into consumer goods immediately when the war is over, may Heaven help us! If much of it is placed in long-term investments in both equities and mortgages, we may build up the productive capacity of our nation. We may advance to a standard of living never before approached in the world, and even undreamed of by our fathers.

But these goals cannot be attained by a nation intent upon wasting its substance in riotous living. Whether an economy be managed by private individuals or by public authorities, so far as the necessity for savings to build up the capital equipment of a country is concerned, no people can eat its cake and have it too. No resources can be used both for consumption and for productive capital at the same time. The choice before the nation and before the individual who will hold the vast purchasing power now being distributed will be whether to spend it or to conserve it. We must make the choice. The extent to which the construction industry is able to find both equity and mortgage financing may be a reliable index of the choice we make. And that choice may determine whether we pursue a course that will reduce us all to a common level of poverty, or raise some to a high level of prosperity and all eventually to a level of greater well-being.

From a paper presented before the Twenty-Fifth Annual Meeting of the Associated General Contractors of America at Chicago, Ill., February 7-9, 1944.

Larkin Rejoins Company

Announcement has been made that Major R. C. Larkin has resumed the presidency of the R. C. Larkin Co., distributor of heavy construction and road maintenance machinery, Chicago, Ill. Major Larkin, who has retired to an inactive Army status, has recently been serving in the Tractor and Crane Section, Office, Chief of Engineers, Washington, D. C.

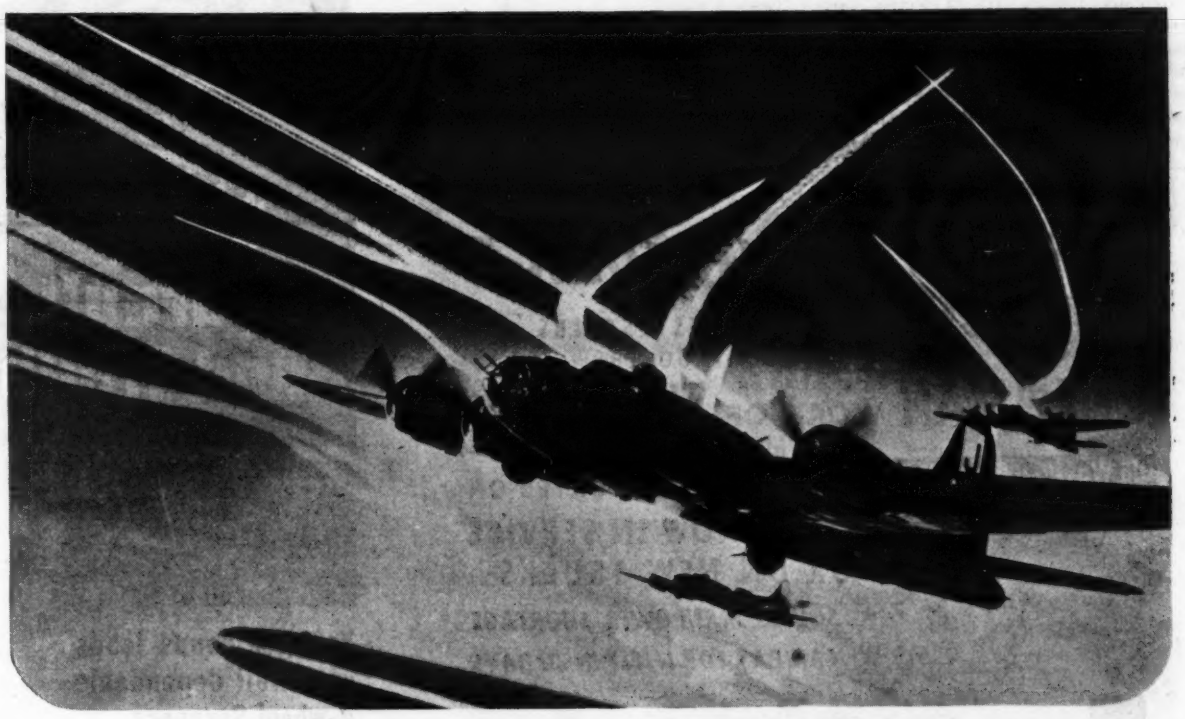
NEED A BIG Trailer?

La Crosse Makes Them Up To 200 Ton Capacity

WRITE OR WIRE

LA CROSSE TRAILER & EQUIPT. CO.
LA CROSSE, WISCONSIN U. S. A.

from the experience of war comes AN AIR COMPRESSOR BUILT TO THE PRECISION OF AN AIRCRAFT MOTOR



AIR PLUS JAEGER COMPRESSOR

Building machines in which *the quality of performance* often decides victory or men's death, America's production lines have learned to work to standards of precision undreamed of yesterday.

Today, these same micro-precision standards are being applied to the manufacture of an air compressor.

The special characteristic of this compressor is the high efficiency obtained with a simple, accessible mechanism.

With parts micro-honed and lapped to equal precision, it functions as smoothly as a bomber's motors. Demands are met without effort. Reserve power is always present. High levels of performance can be maintained for years.

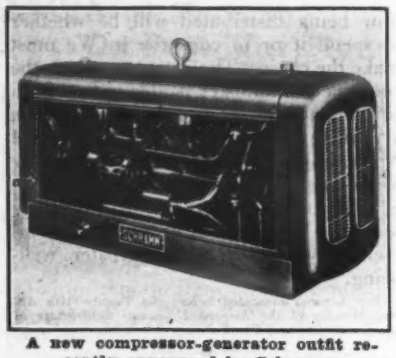
These qualities are identified in a name you will come to know and remember — "AIR PLUS."

All the equipment Jaeger produces today is for war. Please be patient. Our experience and greatly improved facilities will be available to help you to win your battles tomorrow.

THE JAEGER MACHINE CO., COLUMBUS 16, OHIO

JAEGER Engineered EQUIPMENT

"AIR-PLUS" 2-STAGE AIR-COOLED COMPRESSORS, 60 TO 500 FT. — "FLEET-FOOT" CRANE-LOADERS — "SURE PRIME" CENTRIFUGAL PUMPS — "SPEEDLINE" BUILDING MIXERS — "DUAL-MIX" TRUCK MIXERS — "JAEGER" HOISTING ENGINES AND TOWERS — "JAEGER-LAKEWOOD" PAVING EQUIPMENT



A new compressor-generator outfit recently announced by Schramm.

Compressor Combined With 5-Kw Generator

A compact source of compressed air and electric current, arranged for location under a work bench in a portable machine shop or for truck mounting for use on construction jobs, has recently been announced by Schramm, Inc., West Chester, Pa. This Model 60 Fordair compressor with generator will produce 60 cubic feet of compressed air at 100-pounds gage pressure, or 5 kw of single-phase alternating current at 120 volts, or simultaneously compressed air and electric current to the extent of the engine horsepower. The Schramm safety vacuum control limits the supply of air compressed when an electric load is being carried.

The unit consists of a standard Model 60 Fordair compressor mounted on a welded steel frame, with an electric starter, a voltage-controlled-type battery-charging generator, and gasoline pump. The 5-kw 60-cycle 120-volt ac generator has a built-in exciter and is direct-driven from the flywheel of the compressor. Compactly housed, the unit is equipped with a lifting bale so that its location may be easily changed to suit the requirements of the job.

Further information on this compressor-generator unit may be secured by interested contractors and state and county highway departments direct from the manufacturer by mentioning this item.

New Device to Trap Water in Air Lines

Since every user of compressed air is faced with the problem of water in the air lines, the announcement of the new Inco air-strainer water trap, designed to relieve this problem as well as to save lubrication and cut maintenance costs, will be of interest. These Inco water traps were developed by a maintenance man for use in his own plant and, having proved their efficiency there and elsewhere for the past four years, are now on the market for users of compressed air on construction jobs and in equipment-maintenance shops.

The Inco water trap operates on the principle of high-velocity impingement on a cold surface in three stages, to remove moisture and oil. Easily installed in any pipe line, it is not a master trap but is placed in an air-supply line as near as possible to the air tools being used. Outlet connections serve four pieces of equipment with ease, and water exhaust valves are provided for releasing the trapped water.

Further information on these Inco water traps may be secured by those interested direct from the Inco Engineering Co., 200 Third St., N. E., Cedar Rapids, Iowa. Just mention CONTRACTORS AND ENGINEERS MONTHLY.

ANTHONY HYDRAULIC

"TAILGATE LOADER"

CAPACITIES 750 LBS. TO 1500 LBS.

ONE MAN NOW DOES THE WORK OF THREE

Old Way-Requires 3 Men

QUICKLY-EASILY MOUNTED ON TRUCKS NOW IN SERVICE OR ON NEW TRUCKS

★ SOLVES MANPOWER SHORTAGE

★ CAN PAY FOR ITSELF IN 30 DAYS

One man slides heavy cooler onto lowered tailgate. One man operates lever to raise 3 heavy drums. One man easily handles barrels raised flush with floor

NEW WAY with TAILGATE LOADER

★ SAVES MANPOWER! One man now does what three or more formerly did.

★ CUTS LOADING AND UNLOADING TIME! Trucks are loaded and unloaded faster — keeps them on the move.

★ REDUCES PERSONNEL ACCIDENTS! Loads are lifted to body or lowered to ground by powerful hydraulic hoist mechanism controlled by one convenient lever.

★ REDUCES ACCIDENTAL DAMAGE TO VALUABLE MERCHANDISE! No skids, chains or cables to break or slip. Minimizes your damage losses.

ANTHONY'S Z5 PLATFORM HOIST — Makes inexpensive dump body out of platform, stake or grain body

ANTHONY COMPANY, INC.
STREATOR, ILLINOIS

The low price will surprise you. Write or wire for complete information. — Address: Department D-21

KOTAL COLD BITUMINOUS MIXES

LAID IN ANY WEATHER

EXTEND THE PAVING SEASON

PERMIT THE USE OF DIFFICULT AGGREGATES

KOTAL CO.

52 VANDERBILT AVENUE
NEW YORK 17, N. Y.

Hydraulic Bulldozers and Trailbuilders

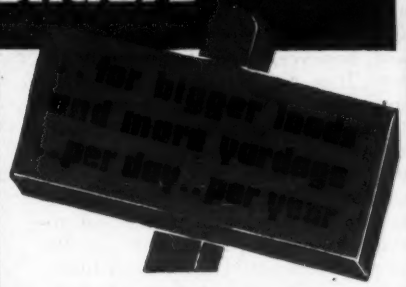
You get bonus loads with Heil dependable 4-wheel Scrapers . . .

Heil design gives you all-welded construction, fulcrum-type lift, ample tire clearance, more efficient performance under widely varying field conditions—feature after feature that will help establish your reputation as a successful operator.

Enjoy the benefits of easier maintenance, longer life, and simpler field repairs when working far from a supply base.

Write for bulletins giving details of Heil's advanced design.

SEE YOUR CLETRAC TRACTOR DISTRIBUTOR



The advanced design of Heil Bulldozers and Trailbuilders assures you of more speed, greater flexibility, and ability to take the tough jobs without wavering.

Heil's experienced fabricators have replaced many of the heavier members with welded box sections that are lighter, stronger, and easier to repair in the field without costly delays.

This equipment is tailormade to Cletrac Tractors, giving you full visibility for safe, efficient handling. The Heil hydraulic system comes close to a perfect leak-proof unit — stays in adjustment and gives you a minimum of trouble.

Achieve a reputation for "on-time" performance with Heil Earth-moving equipment.

Write for bulletins.

R-28

THE HEIL CO.

GENERAL OFFICES — • MILWAUKEE 1, WISCONSIN

Concreting Runways At Southern Air Base

(*Continued from page 47*)

1,100 feet of 25-foot slab 10 inches thick in 10 hours.

The concrete crew consisted of the usual man to dump the trucks, four puddlers, two men in front of the forward screed of the Blaw-Knox double-screed finishing machine, one man with a Jackson vibrator, the plant of which was carried on the finishing machine, two men with a roller bridge using a 12-foot longitudinal float made of a steel channel, and then the finishers.

The first two hand finishers used Cleveland 10-foot aluminum straight-edges, followed by two men with long-handled wooden floats. The surface was then dragged with a garden hose followed by a bow belt. One man cut and edged the center joint and inserted the steel strips. A small burlap drag was used to blot out all edging marks because they are so hard to camouflage.

The curing was done with Ritecure sprayed on by one man using a standard tank and pressure spray machine on four wheels.

The tie-downs were inserted by driving a semi-circular block of wood into the fresh concrete. It had a slot in it so that it straddled the bar cast into the concrete. This method gave a clean hole for the tie-down, and then the area that was disturbed was hand-floated and dragged with the burlap.

The contractor had to construct a large number of manholes and catch basins in the drainage system. Some of them came right in the apron and runways, but most of them were just off the concrete and hence hard to reach economically with the paver. For this reason the contractor chose "to save money" by purchasing ready-mixed concrete delivered from a commercial plant about 2 miles away and poured the odds and ends in this manner so as not to slow up production at the paver.

The Batching Plant

The batching plant serving the paver at Brookley Field was located ¾ mile from the field, and the average haul within the field was also about ¾ mile. A larger than usual stockpile was maintained for both sand and gravel because the deliveries were rather spotty and, when aggregates were delivered, there was much more than could be used in the 24-hour period allowed for unloading. The piles were trimmed by the same RD6 tractor and LeTourneau bulldozer that was used for moving the cars. Another fact worth mentioning because it is really unusual is that the driveway at the batching plant was unusually smooth, showing care in blading to conserve the tires and springs of the batching trucks.

A pair of cranes, a Koehring with an Owen 1¼-yard clamshell bucket and a Bucyrus-Erie 33-B with a Williams 1½-yard bucket, worked back to back handling the sand and gravel to the Blaw-Knox batching plant. The trucks had to back in under the batchers to receive their two batches and then drove to another spur track, where two men in a cement car tossed on the required number of bags of portland cement, and at the next car two other men put aboard the 20 per cent of slag cement.

The batch weights were: 3,326 pounds of gravel and 2,132 pounds of sand for a 9-bag batch in which the slag cement was 22.2 per cent of the total cement content.

Personnel

The contract for the apron paving done in the summer of 1943 was awarded by the Mobile District, U. S. Engineer Department, to Foster & Creighton of Nashville, Tenn., and Mobile, Ala., member of the Associated General Contractors of America. For the contractor the work was in charge of Gilbert Mitchell, Superintendent. For the U. S. Engineer Department, Captain Rex Sikes was Area Engineer.

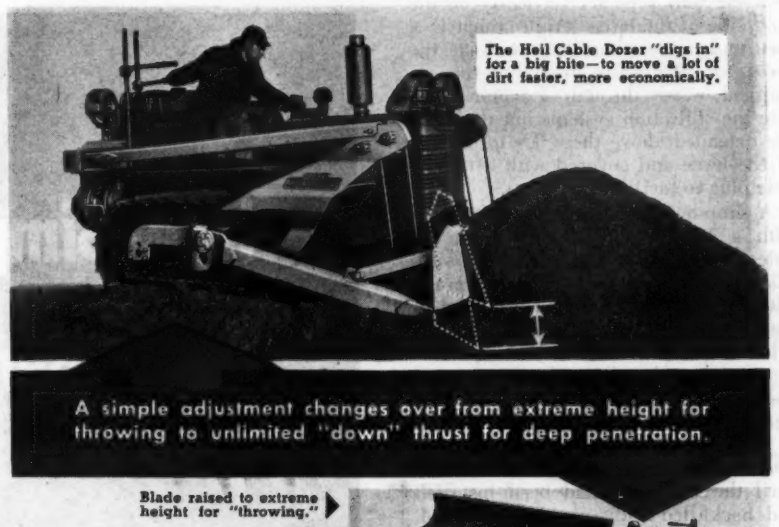
Pamphlet Discusses Flexible Pavements

The Highway Research Board has released the eighth in its series of pamphlets on wartime road problems. The current number, "Thickness of Flexible Pavements for Highway Loads", discusses the road structure, soil classification, thickness of component parts, and design of flexible pavements. Methods of test for the capillary rise of soil and the permeability of porous granular material, as well as a proposed modified soil classification, are contained in the appendices.

Highway engineers may secure copies of this Bulletin No. 8 from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

New C-P Distributor

The Beckwith Machinery Co., 6550 Hamilton Ave., East Liberty, Pittsburgh, Pa., has been appointed by the Chicago Pneumatic Tool Co. of New York as distributor for its line of air compressors, rock drills, wagon drills, and pneumatic and electric tools in the Pittsburgh area. The Beckwith company, which has been in business as a construction equipment dealer for over 35 years, maintains over 130 experienced mechanics and twenty field service trucks to assist their customers in the servicing and rebuilding of construction equipment.


The Heil Cable Dozer "digs in" for a big bite—to move a lot of dirt faster, more economically.
A simple adjustment changes over from extreme height for throwing to unlimited "down" thrust for deep penetration.
Blade raised to extreme height for "throwing."
HEIL
Cable Dozers
. . . easily adjusted for an extra deep bite . . . to move more dirt—faster

The Heil Cable Dozer digs at maximum depth, whether in soft dirt or in hard-packed clay — because Heil engineers have designed this rugged unit to penetrate into the ground up to the tractor's ability to push dirt. Simply place the side arms in the upper hole in the frame, and you can achieve super-penetration.

Heil Cable Dozers are engineered to work with International Harvester TracTracTors as a perfectly balanced team. The simplified mounting avoids obstructing operator's view—gives him full vision ahead. Here is a machine that performs smoothly . . . gives fast, positive action under the toughest conditions, with minimum maintenance.

Trailbuilder blade and "A" frame are interchangeable with the Bulldozer blade and frame.

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R-25

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Fulmore Multiple-Disc Clutches • Over-Center and Spring-Loaded Clutches • Power Take-Offs

Seepage Wells Driven To Protect New Levee

(*Continued from page 30*)

total cross section. Water for optimum moisture content was sprinkled from a 1,000-gallon tank pulled by an International wheel tractor and fed by a Chevrolet truck carrying a 1,000-gallon tank. Three tamping rollers, operating two abreast with the third centered behind them, were pulled by an Allis-Chalmers tractor.

Seepage Wells and Other Structures

To prevent damage to the levee from the rising water table in the pervious subsoil, approximately 400 seepage wells were driven and connected with an extensive collection system built of 8 to 24-inch perforated vitrified-clay pipe discharging through the levee at convenient locations. Each well consists of from 20 to 30 feet of 6-inch pervious-concrete well pipe set vertically on the land side of the levee. Approximately 2 feet under the natural ground at the levee toe, the wells discharge the entrapped water through T connections into the collection systems but the wells are extended above these T's to the top of the levee and covered with a removable plug to facilitate cleaning.

A shop-built rotary drilling rig fitted with a 10-inch soil auger drilled the holes for these wells. Steam was supplied by a Bucyrus-Erie steam crane with a 60-foot boom which was used to handle the drilling rig to and from the White truck on which it was transported, for setting and pulling the 8-inch steel casing, and for handling and furnishing steam for the No. 3 Vulcan hammer used to drive the casing. This was driven as soon as the hole was bored, left in place until the well pipe had been installed and backfilled with open graded sand, and then pulled by two cables wound on a single drum of the steam crane, holding the casing by means of a cable loop choker. Water for the boiler was hauled in a 500-gallon tank mounted on a Ford truck. Excellent results were obtained by this equipment, 19 holes 25 feet deep having been completed in one 9-hour day, according to J. P. Landrum who was Superintendent on this part of the work.

The seepage-water collection system consists of approximately 16,000 linear feet of perforated vitrified-clay pipe from 8 to 24 inches in diameter laid by hand after the trench had been excavated by a Keystone pull shovel.

Where the 96-inch concrete-pipe storm sewer crosses the levee, an overflow manhole was installed on the land side. This has two 9 x 12-foot grates so that, at times of high water when the flood gate on the outlet end of the sewer is closed, storm sewage will discharge into the borrow pits for storage or to be pumped over the levee if necessary, rather than backing up into the town.

The levee is also crossed by a 24-inch vitrified-clay pipe line carrying a discharge of acid water from the refinery. It was deemed advisable to replace the portion of this line which would be under the levee with cast-iron pipe and, since the discharge could be cut off for no longer than two hours without interfering with the refinery operation, it was necessary to make the change speedily. A Bay City crane equipped alternately with a Williams clamshell and a Page dragline bucket handled the excavation and placed the cast-iron pipe while a concrete collar was used to make the connection between the vitrified-clay and cast-iron pipe.

This same crane was used in excavating for a triple 10 x 8-foot culvert which carries a county road across the diversion channel, and for a triple 7 x 9-foot culvert to carry an interurban railroad across the same channel, as well as for the lines of corrugated-metal pipe with seep rings which were installed through the levee for drainage. Backfilling was done by a Caterpillar D6 tractor with a LaPlant-Choate bulldozer and an International 40 with a Bucyrus-Erie bulldozer, both of which units also assisted with the culvert excavation.

U. S. E. D. Photo
The casting yard for the concrete sheet piles was a graded area in sand pits near the Tulsa-West Tulsa, Okla., floodwall.

Concrete Floodwall

On one stretch 260 feet in length, space limitations prevented the construction of the standard levee section and a concrete floodwall consisting of eight monoliths 29 to 33 feet in length was poured in place, supported by concrete sheet piling 10 inches thick, 17¾ inches wide and varying in length from 25 to 29 feet.

Nearby sand pits were graded level for a pile casting yard, and 1 x 6 planks was set on 2 x 4 sills to form a floor for the piling pour. The sides of the piles were formed of 2 x 6 lumber nailed to 2 x 4 studs on 24-inch centers with 2 x 4 cap and base plates. Both male and female interlocks were formed of 16-gage sheet metal bent to form a half circle and turned either into or out from the side forms. Concrete for the piles, furnished by the Standard Paving Co. from

(*Concluded on next page*)

How Simplified Wire Rope Practice Benefits the Consumer

Simplified Practice for wire rope—as defined in recommendation R198-43 of the National Bureau of Standards—has been in effect since February 15, 1943. The industry has whole-heartedly accepted this reduction in sizes, grades and varieties of wire rope.

The overall reduction is from 973 items to 643, or 33.9 per cent. In the four rope constructions which represent the industry's major tonnage, the reduction is from 352 items to 182, or 48 per cent. We think that simplified practice is proving its worth.

To the consumer, there are obvious benefits in simplification. In nearly all cases he will find a rope available that fits his needs, and in addition he will get quicker deliveries and better service.

So we say to wire rope users: Stick to simplified practice ropes. We'll be glad to help you solve your problems. And, of course, simplified practice does not preclude manufacture and sale of special-purpose ropes, such as those listed in our new Wire Rope Catalogue, No. 165. Write to Bethlehem Steel Co., Bethlehem, Pa., for a copy today.

THESE ARE THE 20 STANDARD TYPES OF WIRE ROPE LISTED IN VARIOUS GRADES IN R198-43

- 6 x 7 wire rope
- 6 x 19 wire rope
- 8 x 19 wire rope
- 6 x 37 wire rope
- 6 x 19 elevator rope
- 8 x 19 elevator rope
- 5 x 19 marline clad rope
- 18 x 7 non-rotating rope
- 6 x 12 galvanized running rope and hawsers
- 6 x 24 galvanized steel mooring lines and hawsers
- 6 x 37 galvanized steel hawsers
- 6 x 25 type "B" flattened strand wire rope
- 6 x 30 type "G" flattened strand wire rope
- 6 x 8 type "D" flattened strand wire rope
- 6 x 6 x 7 tiller rope
- 6 x 7 iron, bright, and galvanized sash cords
- 9 x 4 galvanized mast arm rope
- 6 x 19 marline clad grain-shovel rope flat rope
- 6 x 7 galvanized iron rigging and guy rope

New Levee Provides Flood Control in Okla.

(*Continued from preceding page*)

its plant in Tulsa, was delivered in truck mixers, dumped into a 2-hopper Jaeger steel bin, and wheelbarrowed into the piling forms. Piling was cured by the Hunt Process applied by hand-operated sprays.

Driving was done by a No. 2 Vulcan steam hammer mounted in a skid rig having 40-foot leads and equipped with an American 2-drum hoist. Steam for operation of the hoist and hammer was obtained from the boilers of a nearby industry. Operations on the superimposed floodwall had not been started at the time of our visit to this project.

Major Quantities and Personnel

The contract for this work was awarded to Ottinger Brothers of Oklahoma City, Okla., on October 22, 1943, and in order to assure completion by the early date of April 15, 1944, the contractor commenced work on October 23. The amount of the contract was $402,108.20 and the major quantities included:

Stripping	58,000 cu. yds.
Levee embankment	405,000 cu. yds.
Sand fill	75,000 cu. yds.
Placing topsoil	41,000 cu. yds.
Structural excavation	13,500 cu. yds.
Structural backfill	10,200 cu. yds.
Concrete, Class A	3,840 cu. yds.
Concrete, Class B	4,500 cu. yds.
Concrete sheet piling	7,700 lin. ft.
Pipe, corrugated-metal, 12 to 36-inch	1,600 lin. ft.
Pipe, steel, 36-inch	680 lin. ft.
Pipe, perforated vitrified-clay, 8 to 24-inch	16,000 lin. ft.
Automatic flood gates, 4 to 96-inch	9
Graded gravel	3,000 cu. yds.

The work was done under the direction of the Tulsa, Okla., District Office of the U. S. Engineer Department, with First Lieutenant Joe H. Gregory as Area Engineer. A. K. McBride was Superintendent for the contractor.

Needed Construction For Future Aviation

Aviation is an engineer's Utopia where he can work on the many problems that must be solved before commercial and private flying will reach the stage that present-day visionaries predict for the future, according to R. E. Whitmer, Department of Tariffs, Schedules, and Research of Transcontinental & Western Air, Inc., speaking before the North Texas Section of the American Society of Mechanical Engineers at Dallas.

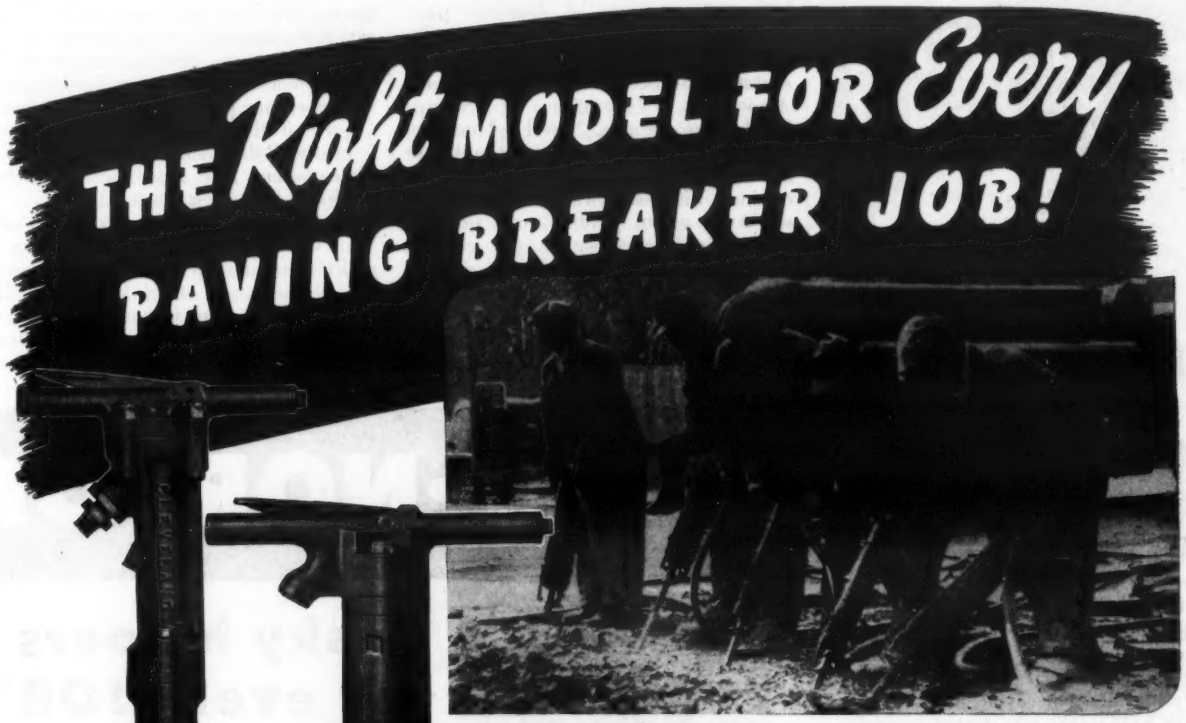
Numerous technical improvements must be made before the average citizen will fly his own airplane or before there will be a general decrease in commercial airline rates, Mr. Whitmer said. "Reduced maintenance requirements, hangar facilities, airway traffic control, improved communication facilities, the location and frequency of airports and landing strips are only a few of the problems that will require considerable study and advancement beyond their present stages before the average individual can derive any real economical transportation advantages by private-plane ownership.

"Likewise, the capacity of airports will be increased with the use of multiple runways so that more than one landing and take off may be made simultaneously," ended Mr. Whitmer in a practical discussion of the future of aviation.

Conservation Saves Money Of Taxpayers in Illinois

During the first nine months of its state-wide conservation program, Illinois effected a reduction of 20,000,000 miles in the use of government-owned motor equipment, and a saving of more than $1,000,000 to the taxpayers, according to a report by Wesley W. Polk, Chief Highway Engineer and State Government Mileage Administrator. The conservation program was carried on through the cooperative efforts of the state and county governments, and by cities exceeding 3,000 population.

THE Right MODEL FOR Every PAVING BREAKER JOB!



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This 58-lb. tool has a long stroke and strikes a very heavy blow. It is noted for its economical air consumption.

CLEVELAND C9
Weighs 82 lbs., and is a slugger suitable for reinforced, well-seasoned concrete. A No. 85 compressor operates two.

CLEVELAND C7
This 80-lb. model is best for all around work on paving breaking and demolition jobs. Two C7's run from a No. 85 compressor.

CLEVELAND C10
This is a smaller (35-lb.) model for light work, trimming, etc. Three C10's run from a No. 85 compressor.

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OWEN BUCKETS
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FOR VICTORY
BUY UNITED STATES
WAR BONDS AND STAMPS

Maintenance Methods In Dade County, Fla.

(*Continued from page 63*)

Dump Trucks
- 17 Fords *
- 1 Chevrolet *
- 2 Internationals **
- 3 Reo's *
- 1 Diamond T *
- 1 GMC

Patch Trucks
- 4 Fords
- 1 Reo

Fire Trucks
- 3 Fords
- 2 Chevrolets
- 1 GMC

Rollers
- 5 Buffalo-Springfields
- 2 Austins
- 1 Acme

Graders
- 5 Caterpillars *
- 1 Adams
- 1 Hart Parr
- 1 International

Bulldozers
- 2 LaPlant-Choates *

Draglines
- 3 (make unknown)**

Road Brooms
- 2 shop-made

Trailers
- 3 (make unknown)

Concrete Mixers
- 3 (make unknown)
- 1 Jaeger

Mowers
- 2 Toros (gang)
- 3 Toros (cycle)
- 1 Topeka (cycle)

Future Projects

The work of the county highway department is now confined entirely to the maintenance of county roads, with the exception of the contract construction of two bridge projects. The Rickenbacker Causeway between the mainland and Virginia and Biscayne Keys, to cost about $4,000,000, was started just before the war, but work has been suspended at the present time under WPB orders due to material shortages. (See CONTRACTORS AND ENGINEERS MONTHLY, January, 1944, page 57). This work will be continued as a post-war project immediately after hostilities cease, to provide a needed facility for traffic to Virginia Key, the site of the new Miami Municipal Airport to be built after the war, and also to Biscayne Key, where a large county park is to be created and new residential developments undertaken later.

The replacing of the Coral Gables Deep Waterway Bridge on LeJeune Road has progressed to the point of completion as a contract operation because of its value in permitting the flow of Navy traffic in the vicinity. This project cost $49,885.

For Your Post-War File

Supplementing previous listings of booklets and pamphlets on post-war planning which appeared in C. & E. M., July, 1943, page 60; September, 1943, page 22; November, 1943, page 8; and January, 1944, page 42, we suggest the following as valuable additions to your post-war planning file.

26. "Blueprint for Postwar Roads and Jobs", 16 pages, 6 x 9 inches: a digest of the ARBA plan for stabilizing the national economy through public works construction. Copies may be secured from the American Road Builders' Association, 1319 F St., N.W., Washington 4, D. C.

27. "Postwar Highway Planning", a bibliography, 18 pages, 6 x 9 inches: a selected list of pamphlets, books and articles which should be most useful to state and county highway officials and others interested in the solution of tomorrow's highway transportation problems. Copies are available from the Automotive Safety Foundation, 321 Tower Bldg., Washington 5, D. C.

28. "Building Codes—An Essential Tool in Urban Development", 16 pages, 6 x 9 inches: a statement prepared by the Construction and Civic Development Department Committee of the U. S. Chamber of Commerce to further a more wide-spread public understanding of the importance of building codes and to enlist public support for their improvement and efficient administration, in order to encourage private enterprise and private capital to assume leadership in post-war building construction activities. Copies are available direct from the Chamber of Commerce of the United States, Washington, D. C.

29. "Blueprint for Tomorrow's Needs Now!", on the importance of water and sewage work in post-war planning, 18 pages, 8½ x 11 inches: this booklet, prepared by a group of representatives of the American Water Works Association, Federation of Sewage Works Associations, New England Water Works Association, and the Water and Sewage Works Manufacturers Association, discusses water and sewage works as useful public works projects and their importance in the growth, prosperity, health, and general welfare of communities, and urges the desirability of blueprinting such projects now so that they can go into construction immediately when they can serve most effectively in providing jobs. Copies may be secured from the Committee on Water and Sewage Development, Suite 2110, 500 Fifth Ave., New York 18, N. Y.

30. "Some A B C's of Postwar Planning", third in a series of pamphlets on management practices, 6 pages, 5½ x 7¾ inches: this outline suggests the following steps for your post-war planning: establish objective, assign responsibility, define the scope, develop the facts, set up a timetable, prepare a formal plan, implement the plan, and get started now! Copies of this folder may be secured from the Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Ave., New York 10, N. Y.

31. "Getting Down to Earth on Post-War Work", a study of economic and political trends up to 1967, 30 pages, 6 x 9 inches: a study by Robert H. Wells, Management Counsellor, of what is likely to happen in the world political and economic scene in the post-war years, and how business can plan intelligently to meet those situations. Copies of this pamphlet, with a chart entitled "Forecast of Industrial Production in the U. S. 1943-67", may be secured from Corrigan, Osburne & Wells, Inc., 60 E. 42nd St., New York City.

Line of Motor Graders For Speedy Road Work

Catalog 275 just received from the Galion Iron Works & Mfg. Co., Galion, Ohio, describes high-capacity motor graders, built for tough and speedy road-building jobs. Action photographs showing these graders performing a variety of construction and maintenance operations are included, together with illustrations of accessory equipment and details of the power units.

Interested highway engineers and contractors can secure copies upon written request to the manufacturer. Just mention this item.

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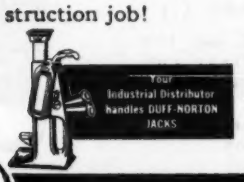

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- Permits discharge of any part of bucket load at any bucket position on boom without returning bucket to paver. Boom can then be swung to next slab to discharge the balance. Thus, each time a split batch is avoided, a batch in mixing time is saved.

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Adjustable Culverts Control Soil Erosion

To meet the threat of soil erosion to valuable farm land, aggravated by the presence of numerous creeks and ravines, the Engineering Department of Marion County, Iowa, has designed a creosoted-wood culvert which is capable of being extended or altered as necessary, according to an article in a recent issue of *Wood Preserving News*. These culverts are installed on county roads where there is need for inlet and outlet drainage at different levels. The 4-foot wall sections are of prefabricated 2-inch-thick southern yellow pine, pressure-treated with coal-tar creosote by an empty-cell process in accordance with Iowa State Highway Department specifications, and are interlocked in a staggered pattern on the site to form the finished structure. Wingwalls and other inlet and outlet devices are arranged to permit removal where land contour or drainage run-off requires a change in length or plan. The drainage openings for which the box is designed range up to 6 x 6 feet in single and multiple units.

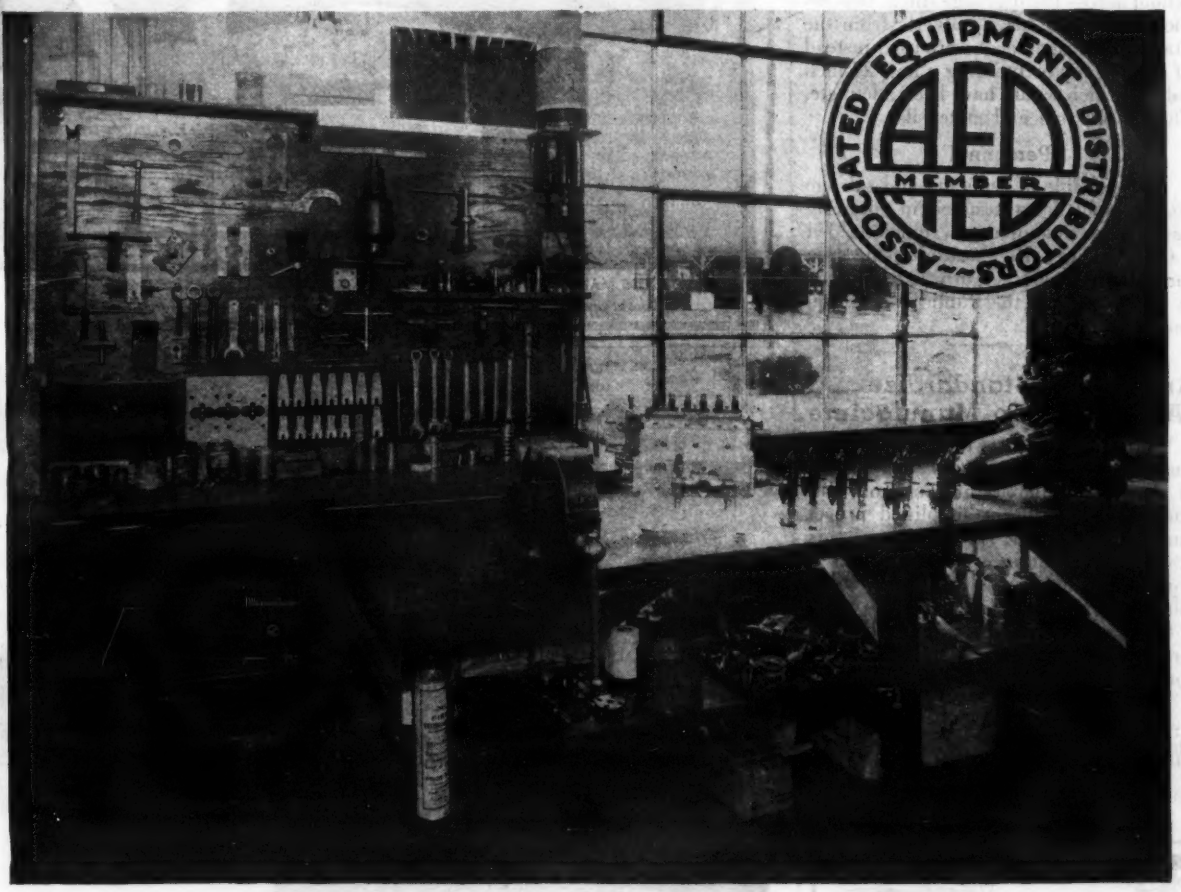
Differences in elevation between inlet and outlet flow lines are ordinarily met by the use of the broken back, the flume outlet, and the drop inlet. The first device combines a horizontal inlet and outlet with a diagonal drop section in the middle. The second has a horizontal inlet and box with a discharge flume on the downstream side, built to match the down slope of the road grade, and is sometimes constructed where sedimentation or filling up is anticipated on the downstream side. It may be equipped with a stilling basin at the lower end of the flume to arrest scour at that point. The drop inlet design is intended for use where the creation of a silt deposit on the upstream side of the road is desired. The depth to which such deposition of soil is produced may ordinarily be regulated by the elevation of the inlet. The box and the outlet of such culverts are usually horizontal.

The design of these culverts, about five hundred of which have been installed on the Marion County highway system, meets the requirements of the American Association of State Highway Officials standard H-15 loading. B. W. Dutton is County Engineer of Marion County, with headquarters at Knoxville.

Simplification of Safety, Relief Valves Approved

A Simplified Practice Recommendation for safety and relief valves became effective February 1. This recommendation, known as R204-44, covers bronze pop safety valves, and bronze, iron and steel relief valves suitable for steam, oil, water, air, and gas in industrial service, and for marine service where applicable. This action was undertaken when it was discovered that the only way all needs for such valves could be met was to reduce the variety which industry was being called upon to make. It is estimated that the simplified list will satisfy 95 per cent of the demand.

A limited number of mimeographed copies of this recommendation may be obtained upon request to the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C. Printed copies will be available later.



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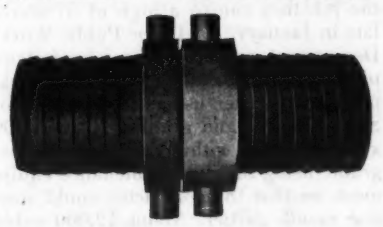

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The strongest clamps of their kind, and easiest to attach. Bolt lugs are heavily reinforced. Tongue and ears for vise jaws are full width of clamp. Perfect conformance to hose circumference, with broad bearing surface, insures equally distributed compression when clamp is tightened, without cutting into hose cover. Sizes: Single Bolt, for hose ⅞" to 5¼" O.D. Double Bolt, for hose 3½" to 17¼" O.D.

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Give full information regarding past experience, territory covered. Applicant must be able to comply with War Manpower requirements in securing release from present position. Address Sales Manager, Davey Compressor Company, Kent, Ohio.

Moving Frozen Dirt Saves Contract Time

Large Area Stripped by Force Account to Speed Fire Control School at Naval Training Station

✦ WITH its spreading acres well filled by the hundreds of buildings needed for training the 80,000 sailors who make up the transient population of the U. S. Naval Training Station at Great Lakes, Ill., the only place left to build the new Fire Control School was in a swampy area at one end of the Station. Orders to speed the work came in mid-winter when the temperatures were running around 5 degrees below zero, but during the job they ran to a high of 57 above late in January, 1944. The Public Works Department undertook the job of stripping the area of the black soil and stockpiling it for later use as top dressing of Station lawns, and grading an area 400 x 500 feet to within 0.1 foot of final grade, using Station maintenance equipment, so that the contractor could start one month earlier. About 12,000 cubic yards of black dirt and stiff clay were involved, either in a frozen condition or thawing in the few balmy days during the work.

Two Caterpillar tractors, an RD7 and a Seventy-Five, were rented to pull a LeTourneau ripper to break the frozen layer of black dirt which varied from 12 inches where there was an insulating growth of rank grass to 24 inches where it was bare of vegetation. The ripper broke the frozen mass into lumps that could be loaded by a Bucyrus-Erie 22-B ¾-yard dragline to six to ten 1½ to 3-ton dump trucks. The ripper was later supplemented by a 4,200-pound skull cracker, operated by a Bay City truck-mounted crane, which also broke up the larger lumps of frozen muck.

Hauling when the temperature was above freezing was very difficult, as the muck was like a thick grease. This was overcome on the hauling road to the stockpile by dumping cinders from the numerous heating plants at the Station.

The maximum excavation for the area was 6 feet while the greatest fill did not run over 2 feet. An International 35 tractor with a 1-yard front-end shovel and a Caterpillar Twenty with a similar ½-yard bucket aided in loading the frozen black dirt, while a Warco and a Caterpillar No. 112 power grader spread the clay, both on the hauling road and for fill, as soon as it was dumped and before it froze and became too hard to handle. One of the front-end shovels was used for about one-third of its time pushing or pulling out trucks.

Drainage

The drainage of the area was another problem. As this site is the lowest in the northwestern end of the Station grounds, it became an underground reservoir for surface water for some 10 or 15 acres in addition to receiving any overflow from a nearby water tank. The problem was licked by excavating a ditch 3 to 6 feet deep and with 2 to 1 side slopes around all four sides of the Fire Control School area and a connecting trench to Skokie Creek some 500 feet distant. The Bucyrus-Erie dragline was used for all trench excavation.

To carry the entrance road to the school across the drainage ditch, two 30-inch corrugated-metal culverts from the Station's salvage depot were used instead of seeking for or building a new 24-inch culvert which would have been adequate. This saved time and materials.

Personnel

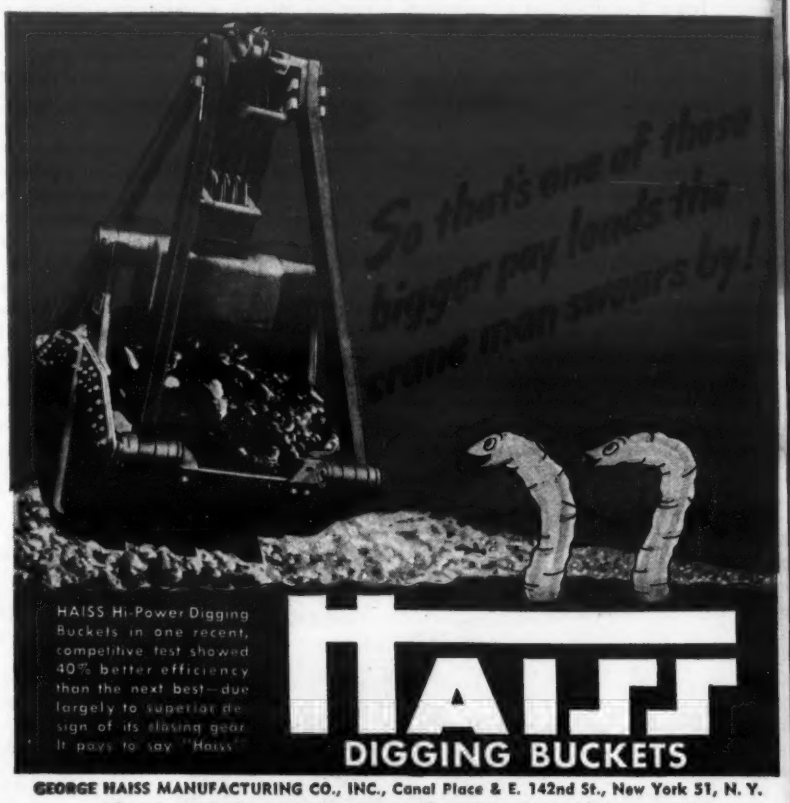
This example of economy and salvage on the home front resulted in speeding the construction of a new much-needed training facility. Preparation of the area for building construction was completed in four weeks by the Public Works Department.

Army-Navy Standardize Airfield Lamp Manufacture

Wartime efficiency, which demands the elimination of unnecessary duplication of work or complexity of operation, will undoubtedly result in simplified procedures after the war. An example of this is reported by engineers of the Westinghouse Electric & Mfg. Co., East Pittsburg, Penna.

In the past there have been twelve different kinds of lights to mark airport boundaries, wind cones, runway approaches and airway obstructions, and there are about twenty manufacturers. This situation resulted in a multiplicity of designs and sizes for the Army and Navy to stock and assemble, so now the two services have adopted one standard marker light. Any one of the twelve different airport lamps now in use can be assembled from the several standardized parts, and each company's parts are interchangeable. As each part has only one function, it is impossible to assemble a lamp to give an incorrect signal.

In adapting their own product to these standardized requirements, Westinghouse engineers report that they have eliminated thirty-six parts.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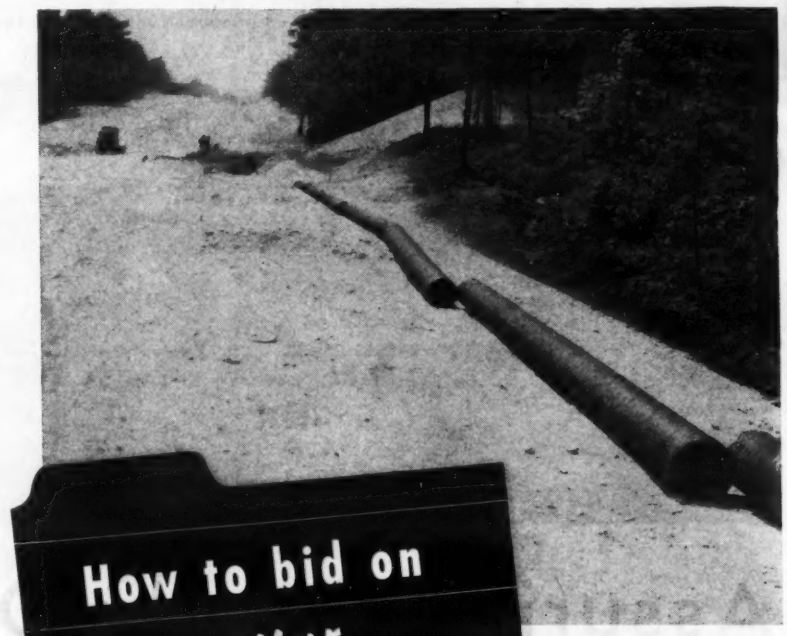

Installing 18,000 ft. of 8-in. ARMCO Hel-Cor Perforated Pipe on the new Philadelphia road in Cecil County, Maryland.

★ ★ ★

New highways after the war will be built differently. If road builders profit by the experience of highway break-ups and airport runway troubles, the new roads will be built on dry, stable foundations.

That means adequate subdrains and more work for the contractor. Farm drainage methods and blind drains will not do. Modern roads will require designed subdrains consisting of: (1) a trench deep enough to intercept all the water before it reaches the roadway, (2) a graded backfill that will keep out silt, (3) a perforated corrugated metal pipe that resists impact, vibration and disjointing, and (4) an adequate outlet.

Because of the light weight, long lengths, few joints, and absence of breakage of ARMCO Perforated Pipe, you can install it quicker and easier and at less cost per foot. You will like to handle this pipe, too, and your job will move along more smoothly. Ask for literature on designed subdrainage. Address: Armco Drainage Products Association, 175 Curtis Street, Middletown, Ohio.

ARMCO
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Figure a MALL Gasoline Powered Concrete Vibrator on your next job and save critical man hours and materials.

By placing a stiffer mix than can be placed by hand, MALL Concrete Vibrators save time, labor, material, and assure a stronger bond with reinforcements. In addition, low-water-cement-ratio concrete placed with a MALL Vibrator is free from honeycombs and voids, is denser, stronger, watertight, and cures faster—permitting an earlier stripping of forms.

MALL Concrete Vibrators are ruggedly constructed for long hard usage. The vibrating elements are made of the toughest materials with special metal, welded tips designed to withstand constant abrasive action. The variable speed gasoline engine starts easily, uses very little fuel and delivers ample power for 8 other interchangeable tools. Easily carried by one man anywhere on the job.

Write at once for literature and prices.

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The salvage of topsoil on highway operations is an important item in seeding for erosion control along shoulders and ditches. An Allis-Chalmers elevating grader removes a few inches of humus in Ohio and stockpiles it just outside the shoulder. Blading it back from the continuous windrow to cover the graded shoulders is a quick and easy final operation.

Aerial Photographs For Highway Plans

The use of aerial photographs and air map mosaics has become standard planning practice in the metropolitan region of Chicago, according to a paper presented before the Twenty-Third Annual Meeting of the Highway Research Board by Robert Kingery, General Manager of the Chicago Regional Planning Association. This practice began back in the late 1920's, when the Association secured a series of air map mosaics of portions of the Cook County Forest Preserves, which had already been put to good use in enabling state and county highway engineers to plan highways around rather than through the forest preserve. More recently, Major George A. Quinlan, Cook County Superintendent of Highways, utilized an air mosaic map in planning an express highway from the central business district of Chicago to connect in a northwesterly direction with major highways at the city limits. Air photographs of 160-acre sections of the city, made on a 1-inch-to-200-feet scale by the Chicago Aerial Survey Co., were fitted together to form a mosaic of the entire area under consideration. This mosaic could be taken apart and the individual pieces studied in detail.

Two supplementary sources of information were used in conjunction with the aerial photographs. Land valuation maps, showing the estimated actual cost per square foot of each block which might be traversed by the highway, and a set of Sanborn Fire Insurance maps, showing every building, its height in stories, material, its use, and the owner, enabled the designers to plan the express route at the lowest cost consistent with satisfactory location, and with maximum consideration for restricted residential neighborhoods, local business centers, churches and public buildings. Readjustment of water mains, sewers and other public and private utilities was also kept to a minimum.

Cold Welding Method For Engine Repairs

A simple cold welding method for repairing cracked motor blocks and heads makes possible putting gas engines back into service quickly after heat and freeze cracks have damaged them. The K & W method of Kerkling &'Co., Bloomington, Ind., is used by large truck and bus operators, tractor and diesel mechanics, and many Army and Navy repair centers.

A K & W mechanical repair makes use of the special K & W metal alloy rod which is used for pinning the cracks. This alloy has extremely low expansion characteristics and very high heat conductivity. In making repairs, the crack is first drilled and tapped, then pins of the K & W metal rod are threaded into the casting, peened and polished, making a permanent repair.

After the crack is pinned, K & W Metallic Seal is circulated through the motor by means of a circulator before assembly, or by pouring the seal into the radiator after assembly, and running the motor until the water reaches at least 200 degrees. The metallic seal adheres to the ends of the metal pins and the inside of the casting, acting as a heat conductor to prevent hot spots.

Complete information on this economical and effective method of repairing cracked motor blocks and heads will be found in Form JSS which illustrates as well as describes the method. Copies will be supplied by the manufacturer to those mentioning this item.

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The Road Contractor's Pump

THE CARVER PUMP CO.
Muscatine, Iowa

Construction Needed; Costs of Improvement

(*Continued from page 65*)

straight lines. Within a block-wide right-of-way the separate roadways may be constructed at different levels in adaptation to an existing transverse slope.

On urban sections of the routes, the planting of trees in formal arrangement will be more appropriate than on rural sections. A tree screen may be used to separate the roadway from an adjacent railroad, freight yard, or industrial siding, or to conceal other unsightly or objectionable roadside conditions. Trees in formal arrangement may be set against the straight lines of the local service ways to insulate bordering residential property from the restless movement of traffic of the expressway. Small flowering trees and vines may be appropriately set in the wider median or lateral areas and on the side slopes of depressed sections to vary the sameness of long stretches of uniform turfed banks.

Construction Required

The report calls attention to the fact that, measured by the standards recommended for the Interregional Highway System, very few of the existing rural roads and almost none of the city streets which conform approximately in location to the recommended system are adequately improved. Less than 1 per cent of the bridges on these rural roads closely approximate the standards proposed.

On the more heavily traveled existing rural roads approximating the recommended system, the only improvements that are known to approach the proposed standards are the Willow Run Expressway System and Detroit Industrial Expressway in Michigan and possibly the Taconic State Parkway in New York, all of which are toll-free, and the Pennsylvania Turnpike in Pennsylvania and the Merritt and Wilbur Cross Parkways in Connecticut, each of which is now operated as a toll road.

Regarding the condition of the existing rural roads, the nearest approach in any particular to the recommended standard of adequacy is reached in the character of the surfaces or pavements. There is a marked correlation between the surfaces and pavements of these existing roads and the volume and weight of the traffic they serve. Of the rural roads included, only 99 miles were unsurfaced in 1942, and untreated gravel and stone surfaces existed on only 168 miles or 0.6 per cent of the total rural mileage. All other sections of the rural roads included are improved with some form of dustless surface or pavement, ranging from bituminous surface-treated gravel or stone surfaces to the highest types of pavement.

But while the existing roads may be said to be reasonably well improved so far as the strength of their surfaces is concerned, they are far from adequate in respect to width and lane arrangements of the surfaces or pavements, gradients and curvature, and the related characteristic of sight distance.

To obtain the additional width and lane arrangement required for conformity to the recommended standards will necessitate almost universal widening which makes more evident the deplorable fact that existing rights-of-way are grossly insufficient to permit such widening. Even, therefore, if it were possible to attain the recommended standards of design without change of existing alignment, a right-of-way problem of great difficulty is presented. The faults of curvature and gradient are so numerous that no approximate compliance with the proposed standard can be achieved on most sections without wide departure from the existing alignment.

Taken together, the two circumstances of insufficient width and inadequate alignment, if the proposed standards are to govern, leave little choice in most sections of the systems other than obtaining entirely new right-of-way; and this conclusion, reached from the consideration of essential dynamic qualities of the highways, agrees with the decision that must inevitably result from any consideration of a desirable directness of routing between the principal sources and objectives of interregional highway traffic.

Costs of Proposed Improvements

It is impossible, on the basis of the very general studies made by the Committee, to venture even an approximate estimate of the total cost of building the entire Interregional System to the standards recommended. It will be expensive beyond the common experience in building most of the ordinary existing highways and streets, but the merit of the expenditure is to be judged not by such a comparison, but rather by the value of the advantages to be gained in traffic facilitation, in reduced costs of vehicle operation, and lowered accident rates.

A large part of the construction in rural areas, however, will not be highly expensive. Sections of the system carrying the general order of traffic volume on rural highways can be built to the standards proposed at costs ranging from $40,000 to $60,000 a mile, where the traffic is less than 1,000 vehicles a day. Where the traffic ranges from 1,000 to 2,000 vehicles, the costs will be from $50,000 to $70,000 per mile. Where the traffic will reach between 3,000 and 15,000 vehicles per day, which will amount to about 30 per cent of the rec-

(*Concluded on next page*)

One of 5 H&B Asphalt Plants in New York City

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FLUIDOMETER
Automatic Metering System—saves time, materials, insures accuracy and uniformity. For all types of asphalt.

● New York City has perhaps the world's biggest and toughest street maintenance and repair job. In spite of the heavy traffic and the great amount of repair work required, the streets of the big city are kept in amazingly good condition—year after year. One of the contributing factors is the dependable production of the five big Hetherington & Berner asphalt plants which serve the city. One of these plants is shown above.

H & B Asphalt Plants—the products of nearly 50 years of specialized experience—are built in both stationary and portable designs, and in capacities to meet the requirements of all size cities and jobs. Complete information will be furnished on request.

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Interregional System's Benefits Distributed

(*Continued from preceding page*)

ommended system, construction costs will range between $100,000 and $700,000 per mile.

The costs of urban sections of the system may be expected to vary more widely than those of the rural sections and are therefore even more difficult to estimate.

Rate of Expenditure; Employment

The provision that has been made by the Federal government for the planning of post-war highway improvements is unparalleled in any other field of public construction. The highway planning now in progress is directed to the completion of definite working plans capable of execution at the appropriate time.

The principle of providing for advance planning and regulated construction of needed public works for the stabilization of industry and the alleviation of unemployment is well established. A complete readiness of desirable projects and a recognition of the propitious time for their launching are essential prerequisites to a fully effective injection of the stimulant of public works in a period when private activity is waning or in transition from war to peacetime production. While the unreadiness of public works projects in sufficient volume to cope with the severity of the recent depression delayed the stimulation of private activity, the eventual public works contribution to recovery, where the contract system was used, fully established the soundness of the stabilization principle.

Precise prediction of the time and manner of the war's end is as difficult as an adequate description of the potentialities of forces currently at work, the resultant of which will determine the fundamental conditions of the post-war era. These limitations, however, need not deter the provision of plans. Rather, the planning will need to be alive to a wide range of possible conditions, and prepared to cope with any conditions that may eventuate, when they occur. For such an approach to post-war planning, the past quarter of a century has provided important signs and guideposts.

A careful study of the economics of direct and indirect employment provided by a large program of highway construction show that indirect employment would be widely distributed throughout the country and would be very quickly generated by the start of such a program of construction. In addition to the benefits to be afforded by the provision of much needed modern highway facilities, the Committee concludes that construction of the recommended Interregional System will make possible the productive utilization of a substantial part of the man-power and industrial capacity likely to be available in the post-war period. It also desires to give special emphasis to the importance of complete readiness for an immediate post-war initiation of construction as a condition precedent to the ultimate success of any comprehensive public works plans which looks toward the stabilization of the national income and the preservation of prosperity in the post-war period. The magnitude of the problems involved in the coordination of Interregional Highway System construction as an integral part of that plan, in the advance planning and design of component high-priority projects, and in the acquisition of required rights-of-way, serve to emphasize the need for their prompt and thorough consideration.

With due regard for the relative needs of improvement within and without the system, it is the Committee's opinion that expenditures in the immediate post-war years at the rate of $500,000,000 per year on urban sections of the Interregional System and $250,000,000 per year on rural sections are necessary, and that such expenditures would constitute a practicable objective that could be achieved, within a total construction expenditure of $2,250,000,000 annually, without jeopardy to the essential improvements of other parts of the entire highway and street systems of the nation.

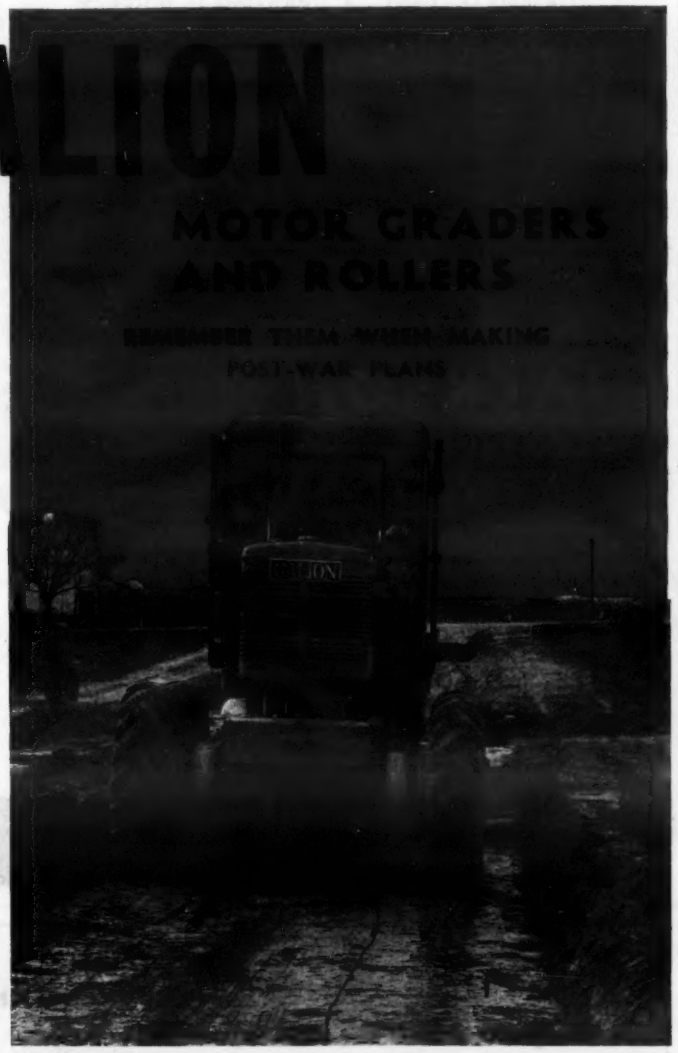
The Committee, therefore, strongly recommends the early provision of all required legal authorization and statutory sanctions, to permit all necessary administrative preparatory measures to follow in swift succession, to insure a prompt beginning of construction on the system at the end of the war and prosecution of such construction at the rate indicated by the annual expenditure of $750,000,000 for a period of at least ten years.

Constructiondizing Award by AGC Board

The annual Constructiondizing Award of the Associated General Contractors of America, Inc., presented annually by Past President A. P. Greensfelder of St. Louis, Mo., for the best work done by a chapter or branch secretary or manager in "selling" the idea of construction by contract, or a needed program of construction, to the public was given to two California chapter managers at the recent annual meeting of the AGC in Chicago.

Floyd O. Booe, Secretary-Manager, Northern California Chapter, San Francisco, and Frank J. Connolly, Manager, Southern California Chapter, Los Angeles, were the recipients by unanimous vote "for their activities in initiating, preparing and assisting in obtaining the passage of an Act establishing the (California) Reconstruction and Reemployment Commission and the appropriation of funds for the design and construction of post-war projects."

GALION



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"GOODALL Style 338"—Rubber coat, 50" long, of thick gauge rubber on special tear-resistant fabric. The best coat made for general construction work.

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Rubber and oiled hats in styles to meet every need or preference. Approved safety hats for construction, tunnel and mine work.

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GOODALL boots and clothing have been rated "*tops*" by construction, roadbuilding and mining men for many years. Inquiries concerning *your* requirements will receive prompt attention. Address our nearest branch or main office.

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Montana Maintenance Under War Conditions

(*Continued from page 15*)

crushing plants are operated by the maintenance department for the production and stockpiling of gravel for base and surface aggregates. On new construction an item of producing and stockpiling gravel for maintenance-department operations, at the rate of approximately 100 cubic yards per mile, is included in the contract. All gravel available is used in a program of maintenance combined with betterment which has been carried on by state forces.

In some cases the old bituminous surface has been left undisturbed to act as a waterproofing diaphragm, strengthened by the addition of 1 foot of new base material. This is covered with a new 2½-inch bituminous mat, usually constructed by road-mixing with MC cut-backs, although SC cut-backs are preferred when they can be obtained. Some penetration work has been done and some use has been made of 150-200-penetration asphaltic cements and high-viscosity emulsions.

In addition to heavy maintenance operations, 600 to 700 miles of armor coating has been necessary annually. This is also done by state forces, using 0.20 to 0.25 gallon of MC-2 or 3 and 20 pounds of crushed gravel, smaller than ⅜-inch, per square yard of treated surface. In some cases, gravel for work of this sort is produced as needed, while in other cases the gravel is taken from stockpiles. A rather unusual procedure which has proved satisfactory is the stockpiling of gravel in windrows on the shoulders, placing it on the road with motor patrols at a later date after the asphaltic material has been distributed on the road surface.

In most of the western part of the state the available bank-run gravel is unsatisfactory for use in either base or mat construction and it is necessary to blend clay in proper proportions with clean crushed creek gravel to obtain an acceptable product. In the eastern part, however, the bank-run gravel is usually satisfactory, which reduces production costs considerably. The fact that local gravel was used for base construction before the present knowledge regarding the suitability of gravels was obtained has also served to reduce maintenance expense in this part of the state and increase it greatly in the western half. This difference is also increased by the fact that the rainfall of the eastern part of Montana is only approximately one-third that of the western half. Frost boils rarely occur east of the Divide and in this section complete rebuilding of any large mileage seldom becomes necessary.

Road Mileage Under Maintenance In Montana
(By Fiscal Years)

Fiscal Year	Unsurfaced	Gravel	Oil	Concrete	Total Miles
1942-43	257.727	408.333	4,537.197	36.363	5,239.620
1941-42	268.002	376.844	4,492.810	36.807	5,174.463
1940-41	254.646	379.690	4,428.995	36.638	5,099.969
1939-40	238.890	394.533	4,273.906	37.513	4,944.842
1938-39	250.071	375.052	4,178.797	36.490	4,840.410
1937-38	253.741	332.642	4,074.071	37.233	4,697.687
1936-37	291.9231	946.3749	3,350.399	40.621	4,629.318
1935-36	352.898	1,248.462	2,712.206	42.581	4,356.147
1934-35	371.964	1,712.608	2,076.272	42.480	4,203.324
1933-34	428.540	2,296.089	1,215.173	41.076	3,980.878
1932-33	739.28	2,229.07	543.29	41.67	3,553.31
1931-32	711.534	2,235.32	408.23	38.477	3,393.561
1930-31	999.479	1,698.462	78.826	43.207	2,819.974
1929-30	596.083	1,627.119	38.83	37.857	2,299.889
1928-29	314.55	1,301.228	13.70	31.96	1.661.438

A great deal of trouble has been caused by the feather-edged top formerly constructed outside the heavy center base section on many miles of highways. The only satisfactory remedy has been to remove this section of surface, excavate the underlying shoulder, and replace it with satisfactory base gravel and a new top.

The only reduction in maintenance operations during the war years has been the practical elimination of striping operations, due to the shortage of materials and labor. A broken center stripe with 33-foot patches of paint and 66-foot gaps is standard on Montana roads, with a solid line on curves, but the repainting of these lines is now done in only the most urgent locations.

Cut-backs for the state maintenance operations are obtained principally from refineries at Great Falls, Laurel, and Billings, from where they are delivered by refinery trucks to conveniently located storage tanks. All district shops have 10,000 to 12,000-gallon storage with arrangements for steam heating, while 4,000-gallon tanks, heated by torches, are permanently located at various other places through the state.

Despite the reduced income and increased operating difficulties incident to the war, no reduction has been made in the mileage of roads maintained nor has any relaxing of requirements been permitted.

Post-War Planning

Under Montana law the 5-cent gasoline-tax receipts go entirely to the Highway Commission, while the counties receive the income from automobile license fees. The gasoline tax generally nets about $5,000,000 annually, of which the average expenditures of the maintenance department require $2,300,000. The amount of $500,000 is set aside annually for the retirement of $3,000,000 of debentures payable in 1949. This ordinarily leaves somewhat over $2,000,000 for acquisition of right-of-way and new construction. Because 14 per cent of the state's area is Federally owned public land, Montana normally matches Federal Aid on a 43-57 per cent basis instead of the 50-50 basis ordinarily used and now has a considerable amount of

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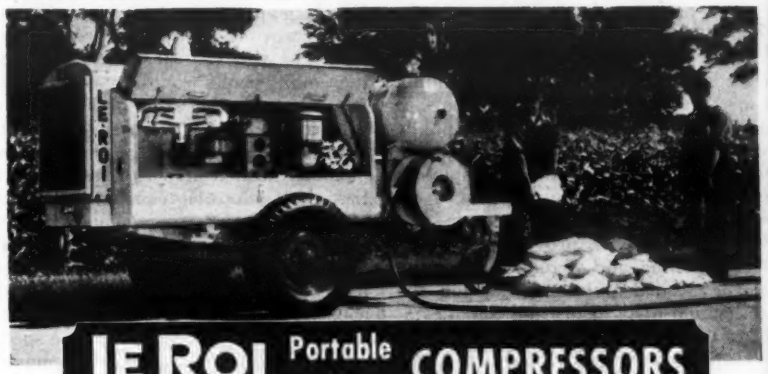

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Future Highway Work Planned in Montana

(*Continued from preceding page*)

unobligated money available. It is contemplated that the primary post-war program will be based on the use of this unobligated balance, insuring a post-war program of approximately $7,000,000 of new construction without additional legislation.

Plans for this amount of work are virtually complete and the acquisition of the right-of-way is progressing at a rate which indicates there will be no delay from this cause when materials of construction and contractors are again available. Probably 80 per cent of the contemplated work is reconstruction on the existing highway system, providing for streamlining, improved alignment, and heavier and stronger bases covered with wider and heavier bituminous tops.

Right-of-Way Acquisition

Negotiations for the acquisition of right-of-way are conducted by Chief Right-of-Way Agent A. F. Swaney, and Highway Commission money is used to pay for right-of-way acquired. Before negotiations are begun, the assessed valuation and recent sales prices of similar property are investigated and an offer based on these facts is made to the land owner. In less than 5 per cent of the acquisitions has it been necessary to resort to condemnation proceedings. When this does become necessary, the legal details are handled by the office of the Assistant Attorney General.

The District Court appoints three appraisers to inspect the land in question and establish its fair value for the court's guidance. This appraised value is ordinarily accepted by the state but, whether it is accepted or an appeal is taken, the land automatically becomes available for construction purposes as soon as the appraisal is filed with the District Court. In urgent cases the entire condemnation proceedings have been completed in a week, although ordinarily more time is required. To make certain that there will be no delays in the start of the post-war construction program because of the unavailability of right-of-way, Mr. Swaney is proceeding with negotiations and necessary condemnation as though the work were already scheduled for construction at a definite date.

At the same time that other right-of-way is obtained, gravel pits are acquired by the state. The materials department is constantly making field surveys and tests to locate acceptable sources of gravel for base and surfacing, and title to these materials is obtained along with other right-of-way. With information available as to quantity and quality, and the title to the materials already obtained, the Highway Commission will advertise for bids designating the source of supply and guaranteeing both quantity and acceptability of the gravel.

Paving Products Catalog

A 12-page catalog describing Keystone mastic-board longitudinal and transverse joints, fibre expansion joints, premoulded asphalt expansion joints, asphalt sealing compound and other paving products has been issued by the Keystone Asphalt Products Co., 43 East Ohio St., Chicago 11, Ill. Interested state and county highway engineers and contractors may secure copies by writing to the manufacturer.

Industrial Brownhoist Chairman of Board Dies

Melvin V. Pattison, Chairman of the Board of Directors of the Industrial Brownhoist Corp., died at his home in Bay City, Mich., on February 11, at the age of 79. Mr. Pattison became connected with the old Brown Hoisting Machinery Co., of Cleveland, as a salesman in 1901. He was later appointed Sales Manager, and then Vice President and General Manager. Following the merger in 1927 with the Industrial Works of Bay City, Mr. Pattison continued in this position with the new corporation, and assumed the presidency in 1934. He has been Chairman of the Board since 1939.

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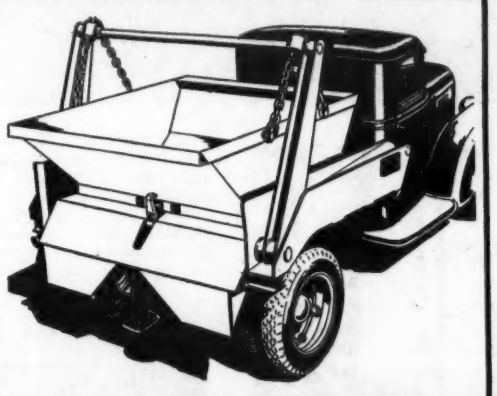

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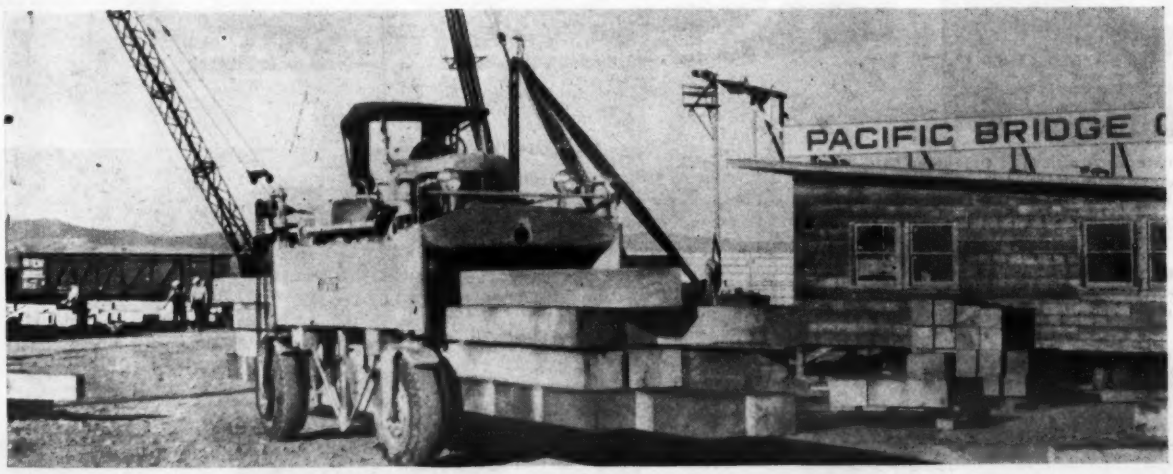

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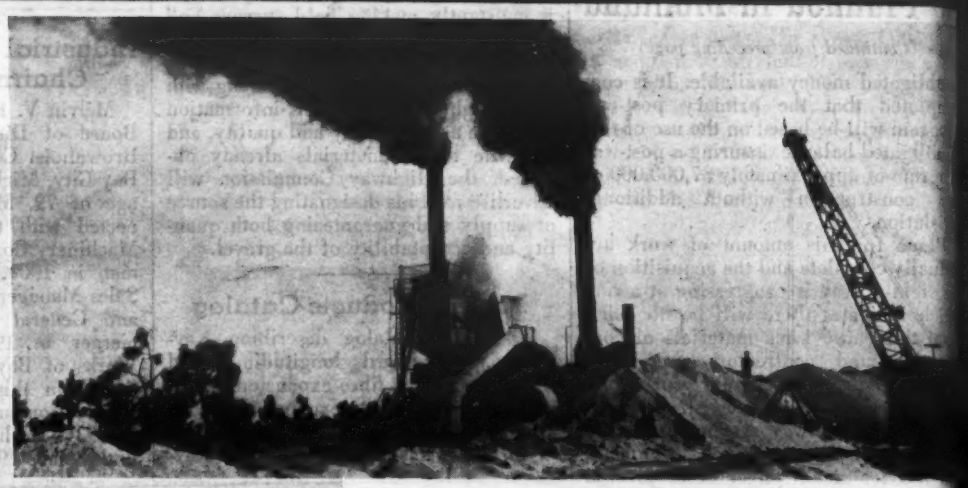
Contractors and Engineers Monthly

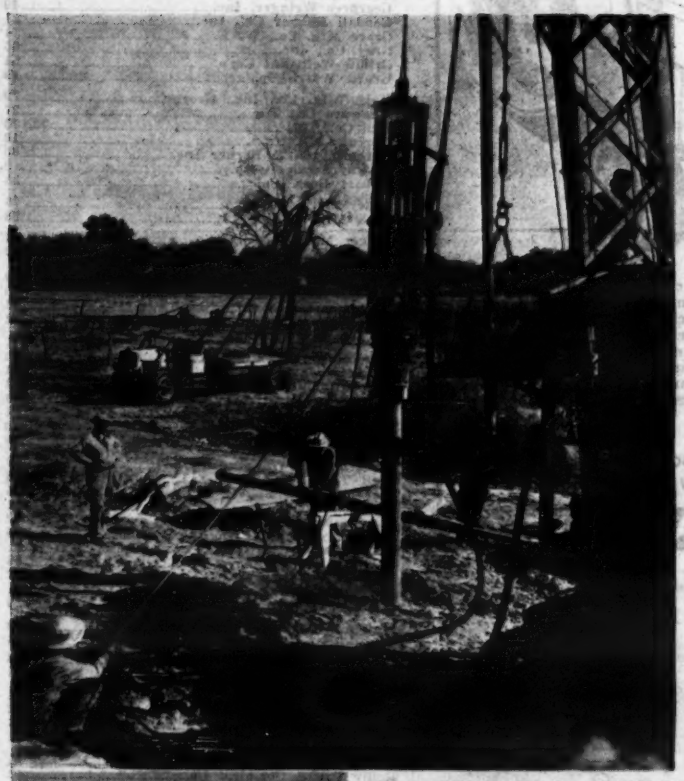
Paving a 10,000 x 500-foot instrument runway at a southern airfield. Right, a general view of the Simplicity System asphalt plant from the aggregate delivery side. This set-up turned out 145 tons of hot-mix an hour. Below, two tamping-leveling-finishers laying 10-foot lanes of binder on the 10,000-foot runway. See page 1.

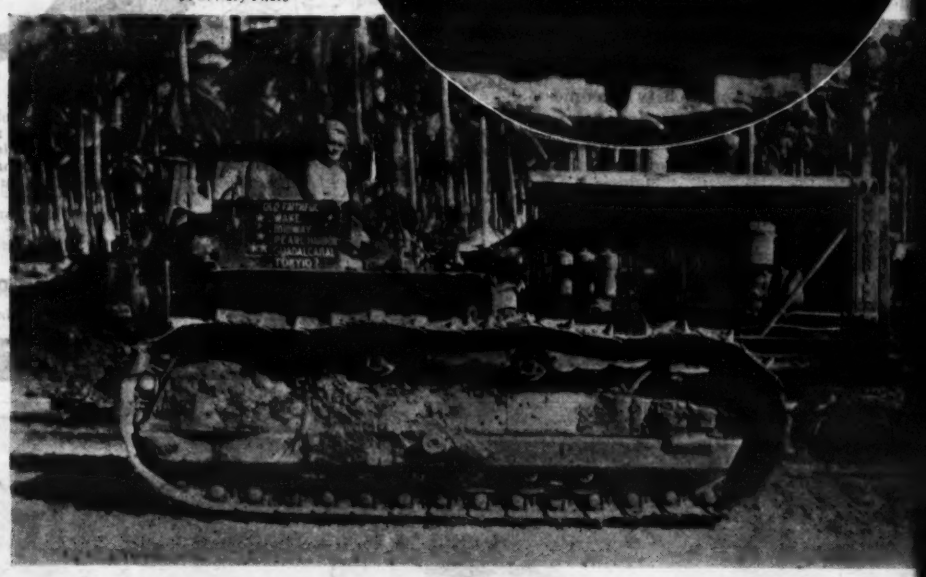
C. & E. M. Photos



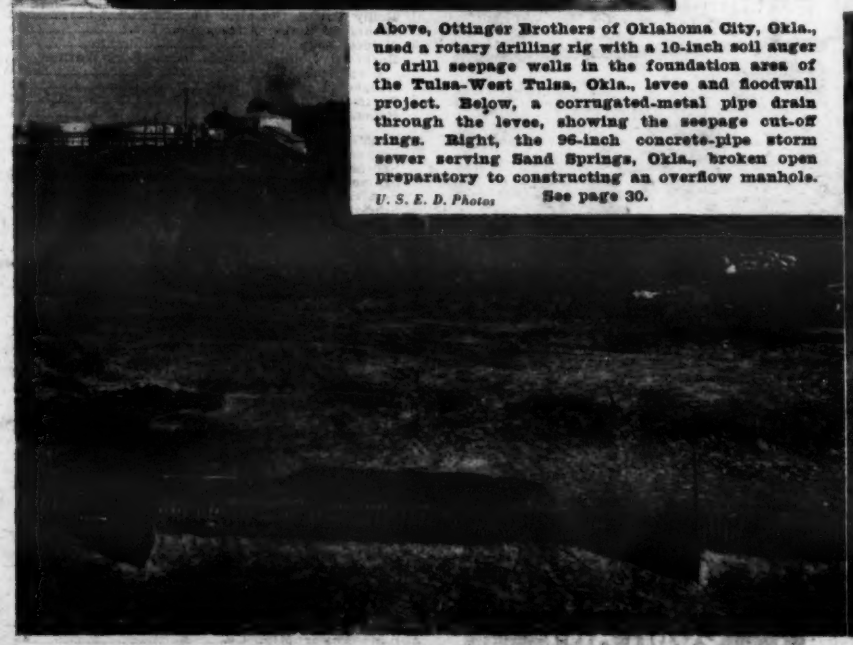
"Old Faithful," a Caterpillar diesel D8 tractor, which was on active duty at Midway at the beginning of the war, then served on both Wake and Guadalcanal Islands, with the Marines and the Seabees. Its next stop is indicated on the sign it wears.

U. S. Navy Photo





Above, Ottinger Brothers of Oklahoma City, Okla., used a rotary drilling rig with a 10-inch soil auger to drill seepage wells in the foundation area of the Tulsa-West Tulsa, Okla., levee and floodwall project. Below, a corrugated-metal pipe drain through the levee, showing the seepage cut-off rings. Right, the 96-inch concrete-pipe storm sewer serving Sand Springs, Okla., broken open preparatory to constructing an overflow manhole.

U. S. E. D. Photos

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